

# POPULAR SCIENCE

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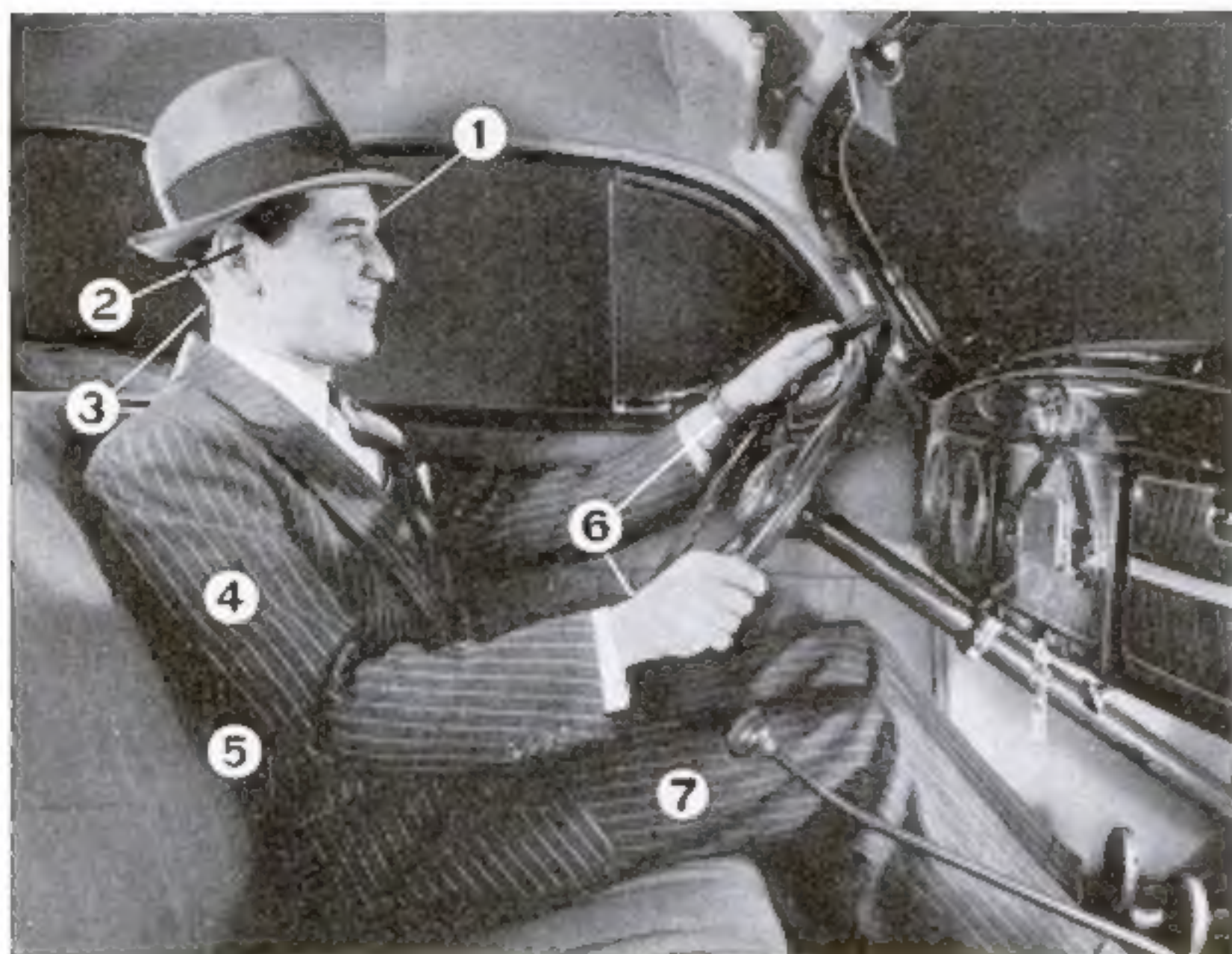
INVENTIONS • MECHANICS • MONEY MAKING IDEAS



May, 1937

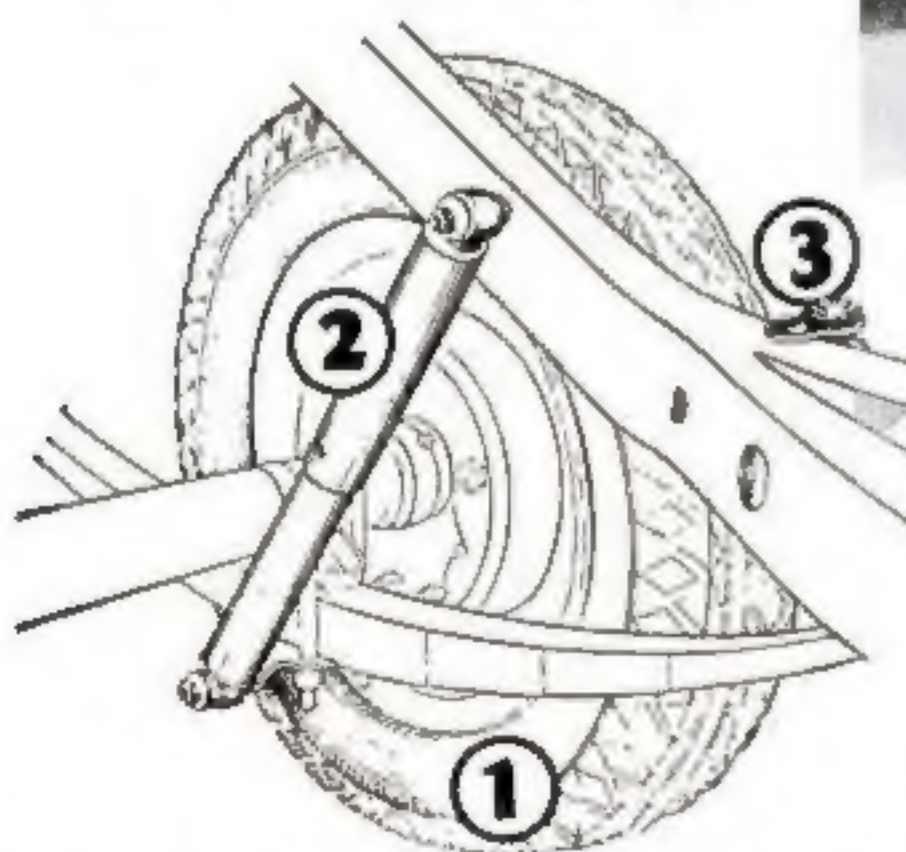


# WAR ON "DRIVING STRAIN" IMPORTANT NEW IDEAS END DRIVING FATIGUE



**RIDE RELAXED** (above) — Eye and neck strain (1 and 3) reduced by means of a wider windshield, safe-vision lighting.

Thorough, scientific insulation banishes tiring road noises that irritate ear-drums (2). Back and leg muscles (5 and 7) are rested and relaxed by comfortable, "chair-height" seats. Effortless steering plus easy, quiet shifting results in far less exertion for arms, hands and wrists (4 and 6).



**ROAD SHOCKS STOPPED** (left) — large Airwheel tires (1), low-pressure shock-absorbers (2), and rubber body mountings (3) insulate the car from road vibration, bumps and jolts.

**NOISE SILENCED** (right) — Plymouth engineers analyzed sounds inside a car. Then they insulated the steel top, sides, doors and floor with five different materials...produced Plymouth's amazing "hushed ride."

## Causes of Fatigue Tracked Down

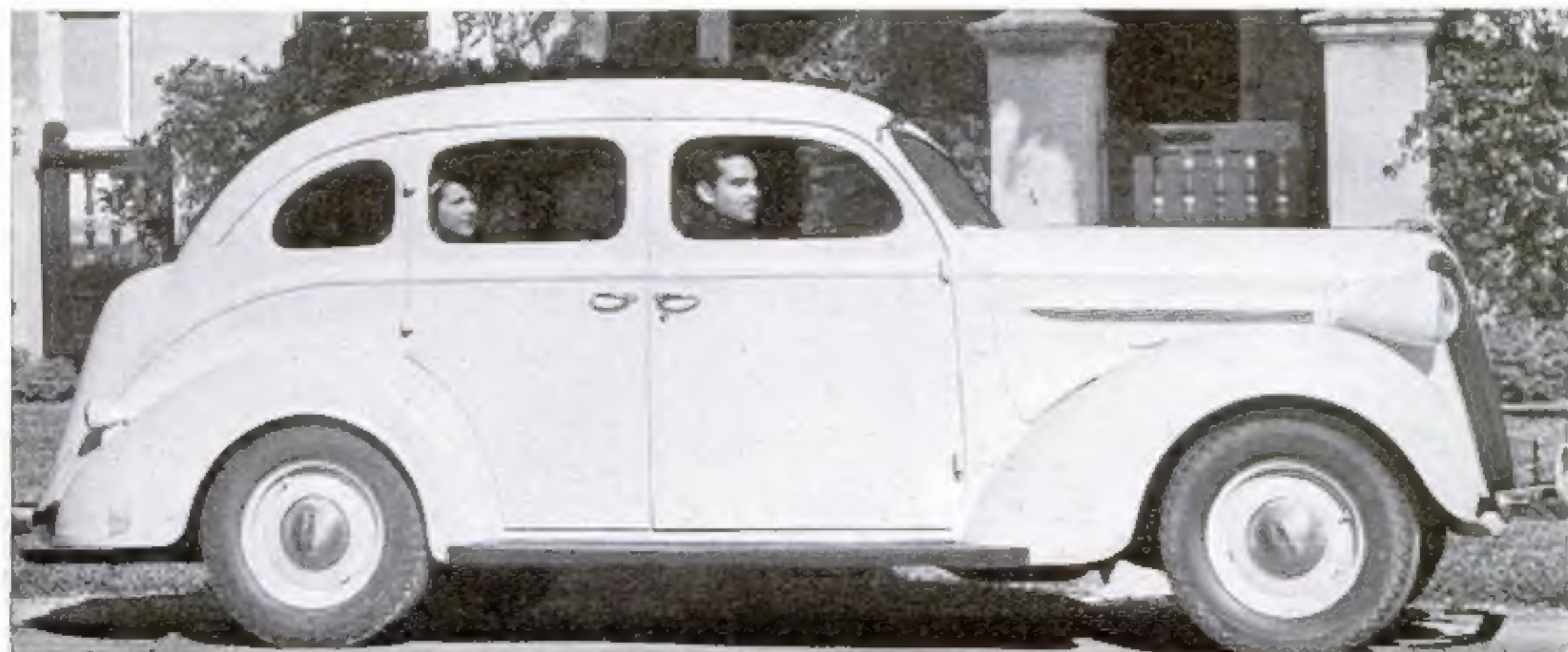
"THINK of the man who drives it!" That is the first consideration of Plymouth engineers.

Eye and ear fatigue...muscular strain in neck, back and legs...no item was too small to escape their attention. They have made your Plymouth easier to handle...more restful to ride in...and therefore safer. PLYMOUTH DIVISION OF CHRYSLER CORPORATION, Detroit, Michigan.



**MORE ROOM** (above) — than ever before...for legs, shoulders, heads. Rumble and vibration are gone because the body is mounted on the frame on live rubber cushions.

**NO LEANING SWAY** (left) on curves. A stabilizer bar, mounted on the frame, is connected with the front axle...it keeps the car on an even keel.



## PRICED WITH THE LOWEST

Today, you'll find Plymouth is priced with the lowest...and offers very convenient terms. You can buy a beautiful, big new Plymouth on remarkably low payments. The Commercial Credit Company has made available—through DeSoto, Chrysler and Dodge dealers—terms which you will find fit your budget...and make it exceptionally easy to purchase...and enjoy...a new Plymouth today.



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# POPULAR SCIENCE

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# BOYS • • here's your chance to DESIGN AUTOMOBILES

— and try for one of these 922 Awards that total \$80,000 in Scholarships, Cash and Trips

TWO separate competitions, sponsored by the Fisher Body Craftsman's Guild, for boys between the ages of 12 and 19 years inclusive—enroll today!

Have you ever thought how *wonderful* it would be to *design* automobiles? Haven't you sometimes thought, when your Dad takes you to the Auto Show, "Bet I could design a snappier car!"

*Maybe you can!* Who knows? Anyway, here's your chance to find out. And to have a lot of fun while you're doing it. And maybe win a wonderful award besides.

## A New Competition

If you're a boy who likes to make things with his hands, you've undoubtedly heard of the Napoleonic Coach Competition sponsored each year for the past 6 years by the Fisher Body Craftsman's Guild. That's a wonderful competition where boys make replicas of an old-time coach such as was used in the days of Napoleon.

This year, in addition to that competition, there's to be *another* one, a *new* one, a competition where you can start from "scratch" and just let *your own ideas* decide what you make.

This new competition is called the *Model Car Design Competition* and the idea is to make a model of the kind of car *you'd* like to build if you were a real honest-to-goodness automobile designer.

## It's Easy

Naturally, you don't have to worry about the "insides" of the car—the things "that make the wheels go 'round." That's a job for engineers.

So you make your model out of some *solid* material. Maybe you'll whittle and chisel it out of wood. Or model it from some other material that will stand handling and judging, just so long as you *design* a miniature model of what you



think a modern automobile should *look* like.

## We Help You!

Now of course, there are certain *proportions* which should be maintained. Besides, you want your car to be *smart*—not just freakish. So, when you enter this competition, you get, free, a full set of Guild drawings and specifications that will help you get a good start on your model.

## TWO Competitions

A lot of boys have entered the Napoleonic Coach Competition in previous years and want to try again. So, that competition is being held again this year.

But this *other* competition—the *Model Car Design Competition* is brand new this year. You can enter either competition you want to.

If you are over 12 years of age and were not yet 16 on September 1st, 1936, you belong in the "Junior Division."

If you are over 16 years and were not yet 20 on September 1st, 1936, you belong in the "Senior Division."

That's only fair—to give the younger fellows an equal chance with the older chaps—*because in each Division there is an equal number of awards totaling the exact same amount.* And that holds good for *both* competitions.

## \$80,000 in Awards

In all, the two competitions carry a total of 922 individual awards worth, all together, \$80,000.

Think of it! Four College Scholarships worth \$5000 *each*, plus 882 cash awards varying all the way from \$100 apiece down to \$25—for boys in *every* state of the Union and the District of Columbia. To say nothing about 36 trips to the 1937 Guild Convention, with all expenses paid. 922 awards in all!

## Here's What to Do

To enter *either* competition costs you not one penny. All you have to be is a boy between the ages of 12 and 20, who lives in the United States. As soon as you enter either competition, we'll send you your Membership Card and Button, and a full set of Guild drawings and specifications—*together with full details about all of the awards and the rules of the competitions.*

## Mail the Coupon Today

The more time you have the better chance you'll have. *So don't delay.* Mail in the coupon today—and get started.

Maybe you will someday be the world's leading designer of automobiles! Think how proud and happy you'll be! And maybe *this* competition will be your *start-ing point!*

We hope so! Anyway, enter one of these competitions and find out.

FISHER BODY CRAFTSMAN'S GUILD  
8-170 General Motors Bldg., Detroit, Michigan

Gentlemen: Please enroll me in the Fisher Body Craftsman's Guild for 1937 in the

- ( ) Model Car Design Competition.  
( ) Napoleonic Coach Competition.

Also please send me my official membership card, button, and full instructions, free of charge.

Name.....

Address.....

City..... State.....

I was born on the.....day of.....19.....

Be sure to check the class in which you wish to be enrolled.

**FISHER BODY CRAFTSMAN'S GUILD**  
*An Educational Foundation sponsored by General Motors*  
**GENERAL MOTORS BUILDING • DETROIT, MICHIGAN**



# POPULAR SCIENCE MONTHLY FOR MAY, 1937

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## Her **FIRST** Telephone Call

A BRAND-NEW CUSTOMER used the telephone this morning. Betty Sue called up that nice little girl around the corner.

Every day, hundreds of Betty Sues speak their first sentences into the telephone. Just little folks, with casual, friendly greetings to each other. Yet their calls are handled as quickly and efficiently as if they concerned the most important affairs of Mother and Daddy. For there is no distinction

in telephone service. Its benefits are available to all — old and young, rich and poor alike. To Betty Sue, the telephone may some day become commonplace. But it is never that to the workers in the Bell System.

There is constant, never-ending search for ways to improve the speed, clarity and efficiency of your telephone calls . . . to provide the most service, and the best, at the lowest possible cost.



**BELL TELEPHONE SYSTEM**



# Our Readers Say



## Maybe the Answer Is To Drink More Milk

IN A RECENT issue, I certainly was glad to see that someone has finally discovered a way to keep nuts, bolts, and other small parts neatly arranged in the home workshop. Before reading the article on handy hardware drawers, I always kept my small parts in cigar boxes and piled them on the shelf, but the method had its disadvantages. Either the box I wanted was on the bottom of the pile, or it had been taken down and not replaced. Then, too, there was no way of having the various sizes properly separated without having so many boxes that they were a problem. Having published this fine article, all you have to do is tell us where to get enough milk cans of the same size to complete a set of these drawers without having to save until one is too old to derive any benefit from them. If any other readers have discovered a good way to save these cans in any quantity, I would appreciate having them tell us how they manage to do it.—A.W.B., Buffalo, N. Y.

WE'VE GOT JUST THE PLACE TO KEEP NUTS



## E.W.P. Is Requested To Look on Page 54

I AM writing, not to criticize your fine magazine, but rather to ask a favor of you. I enjoy every one of your articles, but would like to have you give some space to the Dutch elm disease. I am a lover of trees, and operate a small laboratory here in my home, so an article advising us how to combat this plague would be highly appreciated by me, and, I think, by every owner of an elm tree.—E.W.P., Burlington, Iowa.

## Duck Filter for Guns Would Simplify Hunting

AT LAST science comes to the rescue of wild-fowl hunters! By combining a couple of ideas from the February issue, the sportsman can be sure that he will never mistake the legally protected redhead duck for the greenhead, or mallard, which he is allowed to shoot in season. The wing-beat frequency of the redhead is undoubtedly different from that of the mallard, so by equipping each gun with a photoelectric cell and filter system to pass only the frequency of the former, and connecting this to a safety catch on the trigger, complete protection for the redhead is assured. The hunter sees a duck, aims, and pulls the trigger. If the bird is a redhead, the gun doesn't go off. To save the sportsman's breath after a long tramp in the woods, an additional feature consists of an automatic attachment that says for him, "\*\*\*\*\*!!!"—C.B.G., Jr. Dallas, Tex.



## Dictionary Settles One More Argument

I'M GLAD to be able to correct E.E., who wrote to correct two other readers regarding the visibility of steam. Probably E.E. has learned only one definition of steam, or he would not have written as he did. Any good dictionary defines steam as: 1. The invisible vapor into which water is converted by boiling. 2. The mist formed by the condensation of water vapor. 3. Hence, any exhalation. I think this will clear up the question of whether or not one can see steam coming from a locomotive.—E.R., Niagara Falls, N. Y.

## Male Critic "Burns Up" This Irate Housewife

WHEN I saw the letter of T.R.A., Brooklyn, N. Y., this is the first thing I thought of: "Reuben, Reuben, I've been thinking What a fine world this would be If the men were all transported, Far across the Northern Sea."

In his letter he wanted to start a campaign to teach us housewives how to use tools and machines. He burns me up. I don't see many men using the sewing machine—or the carpet sweeper, either, for that matter. As for using tools, the "man about the house" is never home when anything needs to be fixed. So when the little woman goes ahead and fixes it herself, the husband blames her for putting a nick in the screw driver, or bending a nail. My idea is to educate men in some of the glories that are involved in being a housewife.—J.D., Atlanta, Ga.

WHEN YOU FINISH THAT, THERE ARE THE DISHES AND— AD INFINITUM



## The Third Sock Is Bound To Match One of the Others

ONE need not be a mathematician to solve J.D.'s problem of the socks. It just requires a little logical thinking. The answer is three socks. Here's the explanation: The first two socks picked up may be both red, both blue, or one of each color. But the blindfolded person can't be sure they're both the same color, so he must pick up a third sock, which is sure to match one of the two he has already picked up. The number of socks in the pile has nothing to do with the answer. It's always three. The problem is simple, isn't it?—R.J.S., Jr., Webster Groves, Mo.

## Says Ship-Model Makers Are Wasting Their Time

WORKING in plywood seems to be a hobby with your readers. Why not tell them that they can make more money by producing commercial signs than by turning out ship models? One fellow here in Joplin has made some very handsome signs for local business houses. A particularly striking one has letters

about two inches high cut from plywood and mounted on a four-inch board with beveled edges. The letters are barely stained, while the background is made quite dark and both are nicely varnished. The letters are cut in the style called "thick and thin" by sign writers. It would seem to me that fellows who have tools and equipment suitable for model making could turn their attention to commercial signs to better advantage.—C.J.A., Joplin, Mo.

## Suggests That Foreign Spies Should Read P.S.M.

SOME time ago you published an article telling how other nations steal Uncle Sam's war secrets, and in another issue you describe some of our latest fighting machines. Why don't those other nations just subscribe to P.S.M., and learn all about the latest tanks, antiaircraft guns, airplanes, and gas masks, without the risk of being caught as spies? If they cannot get all the information they want, it is easy for them to send some high-ranking officer to observe our war games and learn the rest of it first hand.—L.N.S., Rapids City, Ill.



## Here's a New Way To Use A Spare Hair Drier

I WOULD like to see plans for a roll-film drier published in one of your coming photography columns. Please try to plan it so as to use a hair drier as the blower. I enjoy every one of the departments, and would like to see some more homemade radio transmitters described. More power to you and your magazine.—J.E., Maspeth, N. Y.

## Floods and Erosion Are Old Stuff, Says He

ONE of the things that always annoy me is this: whenever there is a major or minor flood on one of our American rivers, it is all blamed on man's destructive work in denuding the forests and planting his crops where trees grew before. We are also told that this causes erosion, and that all our top soil is being carried away. Taking the matter of floods first, we know very well that they occurred long before there was any extensive lumbering done. All we have to do is look at the river Nile, which has been overflowing as regularly as clockwork for thousands of years. Records show that this flooding occurred back in the days of the Pharaohs, when the headwaters of the (Continued on page 7)





## OUR READERS SAY

(Continued from page 6)

Nile were still virgin territory. As for erosion, all we have to do is look at the enormous deltas of the Mississippi and Amazon rivers. Their size shows, beyond question, that rich topsoil was being washed down centuries before the white man ever saw America, and before so-called "conservation experts" were heard of.—I.A.L., Dearborn, Mich.

### Remote-Controlled Speedboats Don't Worry This Gob

WHILE I'm not in a position to speak for the naval tactical experts in regard to a battleship's defense against the remote-controlled speedboats loaded with explosives that were proposed in a recent issue by E. W., of Chicago, Ill., I would like to give a seaman's opinion. The best answer, I think, is a five-inch shell, also loaded with explosives.—D.L.P., U.S.S. Arizona.

THIS'LL STOP 'EM!



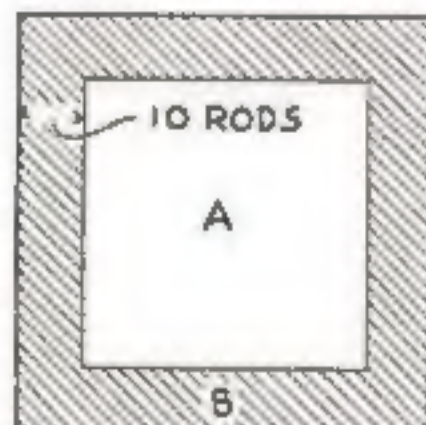
### These Readers Won't Join M.T.L.'s Common-Sense Club

M.T.L., of Brooklyn, N.Y., attacks one of the least questioned and most thoroughly proven theories of astronomy, and, after proposing a fantastic idea, talks about a "common-sense club to help dispel foolish ideas." He would have us believe that dust particles conglomerate in the upper atmosphere until they weigh sometimes a few pounds, sometimes several tons, and fall to earth as meteors. How does he explain that most meteors are of stone or iron, while most dust is carbon? His theory is too absurd to require lengthy refutation. I fear that M.T.L. would fail to qualify for membership in his own common-sense club.—H.J.K., Atlanta, Ga.

I FEEL very sorry for M.T.L. of Brooklyn, N.Y. Apparently he is a man who has never seen the full moon, who has never seen the sun rise or set, who has never seen glorious Venus, who has never gazed on Orion, or Sirius, or seen any of the wonders of the heavens. For M.T.L. says the range of man's eyesight is only thirteen miles high. I wonder where he got that figure.—H.F.G., Milwaukee, Wis.

### Hitch Up Your Wits And Plow Through This One

HERE'S a problem that I haven't yet been able to solve; maybe some of your readers would like to tackle it. A man plows a strip of ground, ten rods wide, around a square plot. The area of the plowed ground equals the area of the unplowed center field. How many acres were plowed?—B.Z., Roundup, Mont.

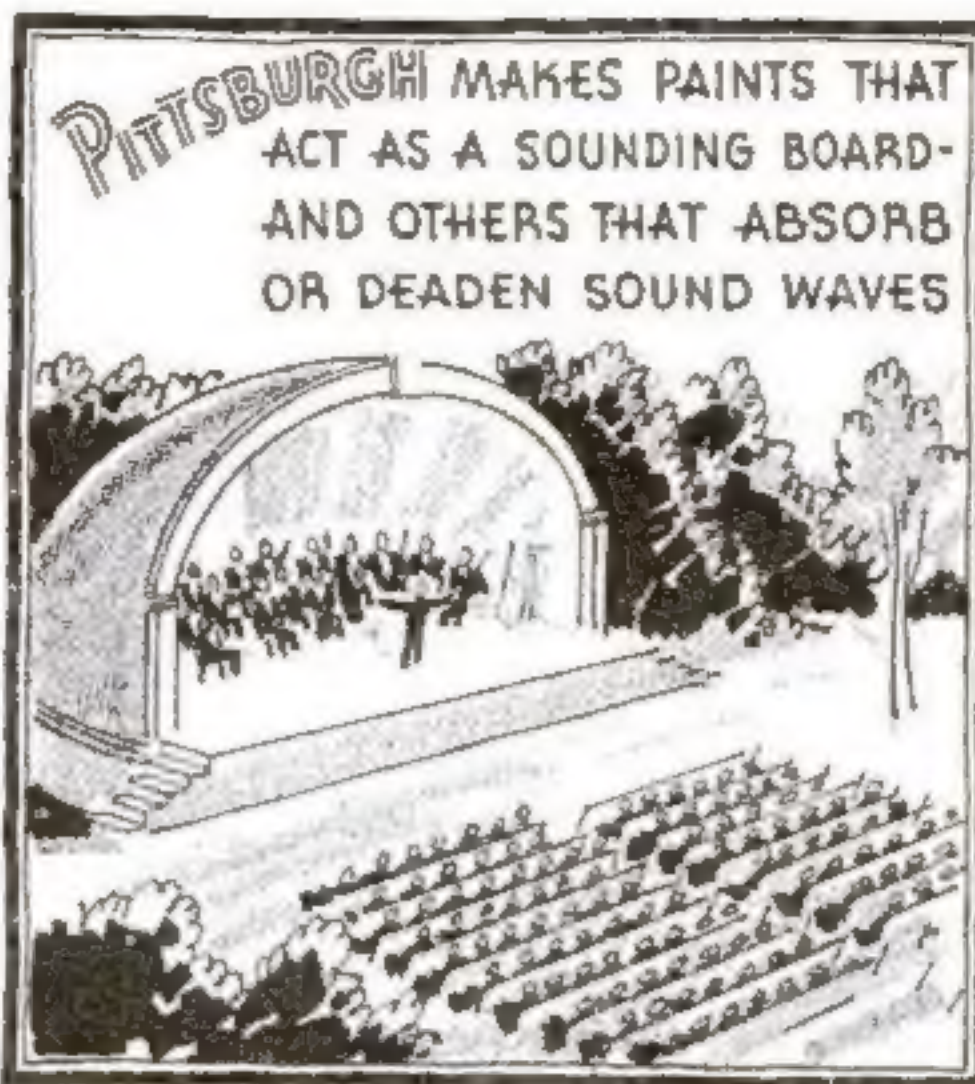


BOTH A & B ARE EQUAL IN AREA

### We Foresee a New Boom in The Clothes-Wringer Industry

HERE is a suggestion for E.S.D., who wants to print etchings on a clothes wringer. Prepare the plate in the regular manner, warm it slightly, and over it put the paper that is to receive the impression, thoroughly dampened, but not too wet. Over this lay a sheet of ordinary paper, then a double thickness of blanket. So far, (Continued on page 8)

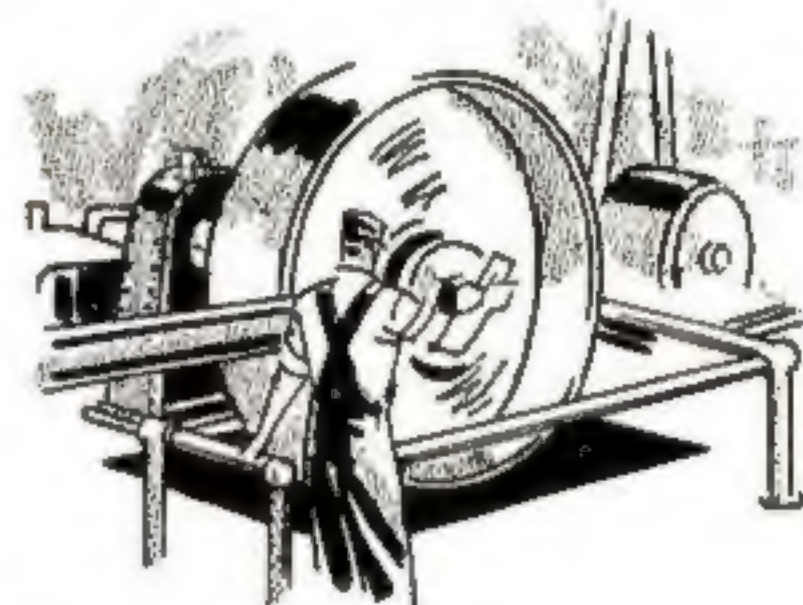
# DID YOU KNOW- INTERESTING AND UNUSUAL FACTS ABOUT PAINT



SOME OF THE 3200 RAW MATERIALS USED IN MAKING PITTSBURGH PAINTS ARE SO COSTLY THAT SHIPMENTS ARE REGISTERED AND INSURED.



SOME PAINTS CHANGE COLORS LIKE A CHAMELEON- APPEARING BLACK IN DAYLIGHT AND GHOSTLY WHITE AT NIGHT. SCIENTISTS DO NOT FULLY UNDERSTAND THIS PHENOMENON.



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# A FILE FOR EVERY PURPOSE

## OUR READERS SAY

(Continued from page 7)

these directions apply to a conventional etching press. Now, lay your etched copper on a piece of the japanned iron known to photographers as a ferrotype plate, and feed it into the wringer. Have a friend on the other side of the rollers, to support the japanned sheet as it comes through. This will lessen the risk of the print being smudged.—M.K.W., West Summerland, B.C.

### Favors Anti-Noise Campaign For Gaudy Checkerboards

IT SEEMS to me that something should be done about gayly colored checkerboards, chessboards, bridge tables, and equipment for other games. Considering the well-known psychological effects of color, what is more contradictory to good sense than the combinations of red and black, red and yellow, and black and yellow so commonly used? Some one ought to pioneer a nationwide movement for the abolition and prohibition of clashing, contrasty colors on checkerboards.—M.G., Brooklyn, N.Y.

### A Solid Gold Bouquet For Our Book Department

I've just finished looking over my copy of your new book, "Electroplating," and want to say that it certainly is complete, clear, and well illustrated. I think we hobbyists owe your magazine a big vote of thanks for all the valuable books it has published for the amateur. Every volume that I have bought from you stands foremost among my reference books. No matter what I look up, your books give the best answer. You sure are tops.—R.G.B., Alberta, Canada.

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PLATED EVERYTHING  
IN THE PLACE!



### He Would Incubate Ideas on Bacteriology

SOME time ago, I sent you a request for articles on organic chemistry. Later, you did publish one good article. Thank you! I do hope you will give us more. And I'm in full agreement with the request for articles on bacteriology. I've started already by making a sterilizer, and I'm going to make an incubator like the one described in P.S.M. I hope you will do your part by publishing an article for amateur bacteriologists.—G.M.B., Grand Forks, N.D.

### Lee Passmore's Open Shutter Is Satisfactorily Explained

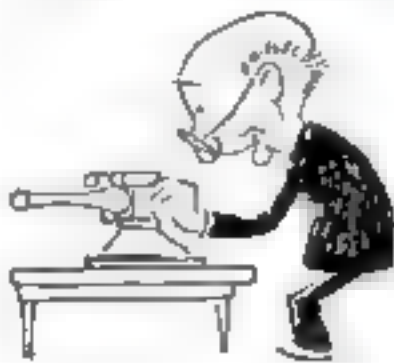
AFTER years of sitting by while the brighter members of the class show off, it gives me great pleasure to be able to raise my hand with an answer to a question in Our Readers Say. R.A.B., of Detroit, Mich., wants to know why Lee Passmore, the insect photographer, doesn't get a "ghost" image on his film when he waits all night with his camera shutter open to catch a trapdoor spider coming out on her front porch for the groceries. What worries R.A.B., it seems, is the fact that Passmore keeps turning a pocket flash light on the door of the nest, which might logically be expected to register a faint image of the closed door before the flash gun is set off to show the bug opening the door. I would say that Passmore probably has his lens stopped down so small that the weak reflection of the flash light from the dark ground does not register on the cut film—and if it did, it wouldn't show on the developed (Continued on page 9)



(Continued from page 8)

**Former "Man Behind the Gun"  
Now Wants To Model 'em**

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I USED ON THE  
OLYMPIA AT MANILA?



## Says Captain McCann Has Only Scratched the Surface

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Three prize winning letters in POPULAR SCIENCE MONTHLY'S new Secrets of Success contest—"What Home Study Has Meant to Me"—are printed below. Read these stories carefully because your own career may be just as interesting and inspiring to other readers. If you think so, put it down on paper and send it in. We will pay \$5 for every letter we publish.

### CONTEST RULES

Only letters from bonafide home study school students will be considered and these must contain the name of the school and the name of the company, or companies, for whom you have worked since graduation. (Names, however, will be deleted from the letters when published.) We also want to know the kind of course you took and the type of position you have held. Your own identity will be kept anonymous, if desired.

We are interested in facts, not literary ability, but please write clearly, completely, and keep your letter within 750 words. We are not looking for "get-rich-quick" stories or freak adventures, and authors must be prepared to substantiate the truth of the statements. Manuscripts submitted and printed become the property of this magazine, and we are not responsible for the return of rejected stories unless sufficient postage is provided for this purpose. Address your contribution to Success Story Department, POPULAR SCIENCE MONTHLY, 353 Fourth Avenue, New York, N. Y.

## TURNED STUDY OF HOBBY INTO REGULAR JOB

The circumstances under which I enrolled for—and later tested out—a home study course in automobile ignition were unusual but they serve to show what such study can do for one, even under the most adverse conditions.

When I enrolled for this course in 1928, I had no definite object in doing so except that I drove a car and wanted to know something about it. I liked to fuss around my car, but my actual knowledge was that of the average car owner and driver, and no more.

True, I had a very hazy and impractical thought that if I had a lot of capital I would like to start some time in a business along that line, but I never took it seriously. I had worked for many years in a wood-working factory. The job was steady; the pay was good. Then, one day, there came a new superintendent.

Working for him was nearly impossible but I stayed on through habit until the end came in 1929, when I found that long service alone will not hold a man's job under a new boss. I realized that in some way a man must train himself to be indispensable. I was not.

Thus, with the beginning of the depression, I found myself jobless, penniless,

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LASALLE EXTENSION UNIVERSITY, Dept. 583-R, Chicago



## Secrets of Success

with a home to support. I was past forty, in poor health and—as I saw it—untrained.

I had actually forgotten my home study course, or rather did not think of it as of use in the present emergency, until one day I happened to walk by the electrical division of the ——— Corporation. This firm is widely known both for its magnitude and its successful career in an unusual line. They will not hire an inexperienced man, usually demanding automotive factory training, but if you hold your job there for more than a day, it may be presumed that you "know your stuff".

Acting on the wildest kind of impulse, I, who had never taken a generator, starter or ignition unit apart much less put one together, applied for work as an experienced auto electrician. In some odd way they conceived the idea that I had had about twenty years experience in "trouble shooting" and repair, and now as I look back I believe it must have been a case of mistaken identity, because men on the service floor actually "remembered" working with me in other places years before.

I made mistakes, of course, but the point is, they were looked upon as the usual slips of a trained man. Each night I studied sections of that course over and over, and gradually it dawned upon me that I really was a trained man but had not appreciated the fact.

Throughout all these eight years, my health has been the same handicap it has always been, keeping me from effort I would have otherwise made, but in spite of it home study has enabled me to work at good money with a good firm, and this at a time when other men were tramping the streets.

Barring health at present, I could start out tomorrow and, with the training that course has given me, break my way into a job in any city wherever it might be.

—H.L.V., Rochester, N.Y.

## A YOUNG MAN ALREADY ON HIS WAY

Two and a half years ago, I was working in a small-town movie theatre at \$3 a week as ticket catcher, sign painter, part-time janitor and getting experience as a projectionist as part pay.

I was doing this because I was interested in learning the trade, but while working here a correspondence course salesman talked with me about the future of radio and television which I could readily see offered many more advantages than my (then) current ambition.

So with my \$12 a month, I began the course, paying \$10 per month on it. Within a few months, I was doing part-time service work and earning quite a bit more than my salary at the theatre. What's more, it was a much more fascinating field of work, so I started in earnest by opening a shop of my own.

I now have a nice service business fully equipped for this town and, in addition, a complete sound system, which I find is a very profitable side of radio work, and have owned three cars. I am now ready to take my examinations for a first class radio telephone license of which I am quite confident of passing.

# PATENT FACTS

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## INVENTORS

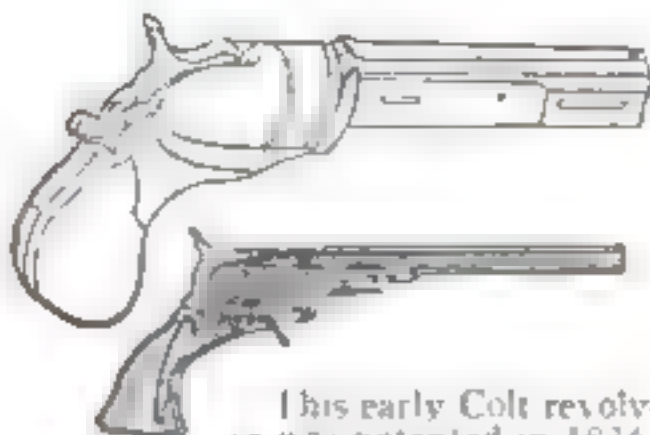
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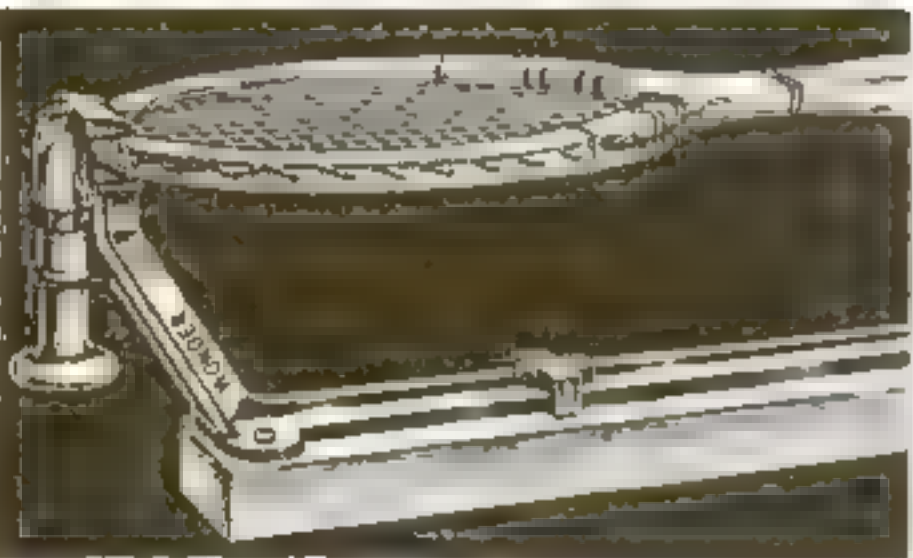
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## Secrets of Success

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—F.C., Cross Plains, Texas.

## COLLEGE MAN BRUSHES UP WITH HOME STUDY

I graduated from an accredited university during the depths of the depression with a Bachelor of Engineering degree but I could not find any sort of a good position in the one field upon which I had specialized—metallurgy. The only job available was laboring in a lead foundry. Later I worked in an iron foundry and finally I got to be night foreman in a cast-iron pipe company. This being far from what I wanted, I eventually quit and found a position in the laboratory of a concern making artificial leather only to discover that since graduation I had become rusty on analytical methods and very lax in my habits around the lab.

Consequently, I enrolled for a course in organic chemistry, qualitative chemistry and quantitative chemistry with the — Schools. After much home study, I realized that my knowledge of this branch of chemistry had increased considerably and that I could do my work better and more efficiently.

Although the depression cost me this job in 1931, I quickly found another, this time with the — Rubber Company. Starting at \$20 a week, I have had six different raises since then and I am at present assistant to the chief chemist. In the meanwhile, I have turned down several tempting offers because I felt there was a real future here.

—F.H.L., East Weymouth, Mass.

## ELECTRICITY IN PIPES HELPS HALT CORROSION

WINDMILLS are now being used to protect the network of pipe lines in the oil regions of the Southwest. Chemical action of damp soil on iron pipes creates electric currents that pass into the ground, carrying away electrically charged particles and so causing the pipes to disintegrate. Engineers have found that an electric current, forced in a reverse direction, would not only stop the eating away of the iron, but would, in addition, cover the pipes with a protective coat of hydrogen gas. To supply the needed current cheaply, windmills, driving low-voltage generators, are being set up. The steady winds of the Southwest then supply current continuously enough so that excessive corrosion is checked.

## VOLCANOES ARE BLAMED FOR CAUSING FLOODS

DESTRUCTIVE floods in Iceland have been caused by fires, according to a recent investigation by Dr. Niels Nielsen, Danish geologist. Eruptions of volcanic vents under thick glaciers released heat that melted the glacier ice rapidly, creating vast flows of water that resulted in disastrous floods.

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## SMELLS ARE FROZEN FOR LABORATORY TEST

**FREEZING** a smell and carrying it back to the laboratory for examination is the unique feat accomplished in recent tests designed to free sleeping cars of stale odors. The air in air-conditioned cars is recirculated, and the odors of smoke, cooking, and a general mustiness tend to accumulate. In investigating causes and remedies for the condition, it was first necessary to measure the impurities in the air, and since laboratory apparatus could not be carried on each railroad car, samples had to be secured. A small suction apparatus was arranged to draw air continually from the car at a regular rate, and pass it through a tube kept very cold by dry ice. All the moisture in the air, along with any odors, condensed and froze inside the tube. At the end of the trip, the tube was brought to the laboratory and warmed to release the concentrated smells. Odors were measured by determining the amount of fresh air necessary to make the bad smell imperceptible. As a result of these tests, a filter, using activated carbon, the ingredient of early World War masks, has been devised for use in the air-conditioning equipment. It is said to remove all objectionable odors, and to have a life of at least four months.

## BICARBONATE OF SODA CALLED FATIGUE CURE

**ENDURANCE** and physical capacity can be increased from thirty to one hundred percent by doses of sodium bicarbonate, a Berlin scientist reports. Numerous experiments in the laboratory as well as in the field of sports are said to have shown that an increase in the body's alkali content enables the system to dispose readily of lactic acid, which is the principal cause of exhaustion. A runner thus prepared was able to run at full speed for forty-two minutes, instead of his normal endurance of twenty, and a bicycle racer was able to maintain a sixteen-minute sprint, when his previous record was eleven. The method is said to be wholly different from the use of drugs, because, unlike the latter, it does not increase the bodily effort required for a task. Aside from the field of sport, the system is expected to be useful for increasing the efficiency and endurance of soldiers in an attack.

## CHECK YARN QUALITY WITH POLARIZED LIGHT

**POLARIZED LIGHT** is employed in a new method of examining yarns which has been developed by Prof. Edward R. Schwarz, of the Massachusetts Institute of Technology, Cambridge, Mass. Studying the fibers under a microscope while illuminating them with the "one-way" light, he is able to detect inferior material. While undyed yarns are nearly colorless in ordinary light, they exhibit various brilliant hues under the polarized rays. These colors are telltale signs showing, particularly in the case of cotton, the presence of "unripe" fibers which would produce weak spots in the woven cloth.

# Accountancy Home-Study

## made interesting and practical thru problem method

**Y**OU know as well as we do that Accountancy fits many men for positions that pay three and five and ten thousand dollars a year—gives many other men unusual opportunity to start a profitable growing business of their own.

The only question is—just how practical is it for you to train yourself adequately in Accountancy through home study?

And the answer lies in the LaSalle Problem Method.

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Suppose it were your privilege every day to sit in conference with the auditor of your company or the head of a successful accounting firm. Suppose every day he were to lay before you in systematic order the various problems he is compelled to solve, and were to explain to you the principles by which he solves them. Suppose that one by one you were to work those problems out—returning to him every day for counsel and assistance—

Granted that privilege, surely your advancement would be faster by far than that of the man who is compelled to pick up his knowledge by study of theory alone.

Under the LaSalle Problem Method you pursue, to all intents and purposes, that identical plan. You advance by solving problems.

Only—instead of having at your command the counsel of a single individual—one accountant—you have back of you the organized experience of the largest business training institution in the world, the authoritative findings of scores of able accounting specialists, the actual procedure of the most successful accountants.

Thus—instead of fumbling and blundering—you are coached in the solving of the very problems you must face in the higher accounting positions or in an accounting practice of your own. Step by step, you work them out for yourself—until, at the end of your training, you have the kind of ability and experience for which business is willing and glad to pay real money—just as it was glad to pay these men.\*

### Five Men Who Tested and Proved It for You

For instance, there was the plumber who started Accountancy training with us in 1916. After a short period of study, he took a position as bookkeeper for a year, and then became accountant for a leading automobile manufacturer—

with two bookkeepers under him. Today he is auditor of one of the foremost banks in his state and his salary is 325 percent larger than when he started training.

He writes, "My training is the best investment I've ever made, showing a cash value running into five figures."

And the young clerk, earning \$75 a month eleven years ago and now getting many times that as general auditor for an outstanding, nation-wide organization. Within six months after he began our training, he was earning \$125 a month and within four years, he was earning \$250.

Do you wonder that he writes, "While LaSalle ads once seemed like fairy tales to me, now I know from personal experience that they are true?"

Or let us tell you about two men—one a stenographer and the other a retail clerk—neither of whom knew more than the simplest elements of bookkeeping. One is now the comptroller and the other the assistant comptroller of a large company.

"LaSalle training in Higher Accountancy," write both, "was the important factor in our rapid climb."

And if you are thinking about the C. P. A. degree and a public accounting business of your own, read about the pharmacist who was earning \$30 a week eleven years ago when a LaSalle registrar secured his enrollment for Accountancy training. Eight months later he left the drug store to take a bookkeeping job at \$20 a week—less money but larger opportunity. Three years later he passed the C. P. A. examination and a year later yet he was earning \$5,000 a year. Now he has his own highly successful public accounting firm for which he says, "My LaSalle training has been largely responsible."

### One-Tenth of All C. P. A.'s Are LaSalle Trained

If you want still more proof, remember that 1,400 C. P. A.'s—approximately one-tenth of all those in the United States who have ever passed the difficult examination for this coveted degree—are LaSalle trained.

Or remember that in our files—accessible on request—are thousands of letters from our Accountancy graduates reporting material increases—some double, triple—and even more—over their original earnings.

And knowing these facts, ask yourself if there can be any further question about the practicability of this training for you—ask rather if the real question is not about the size of your own ambition and the quality of your determination.

For Accountancy is no magic wand for the lazy or the fearful or the quitter—it offers success only to the alert adult who has the courage to face the facts and the will to carry on till the job is done.

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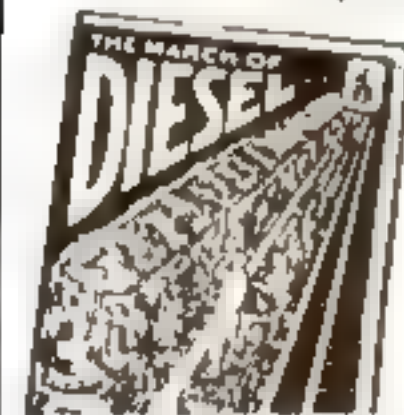
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# Homes for Everybody

## SMALL HOUSES BUILT FOR LESS THAN \$4,000

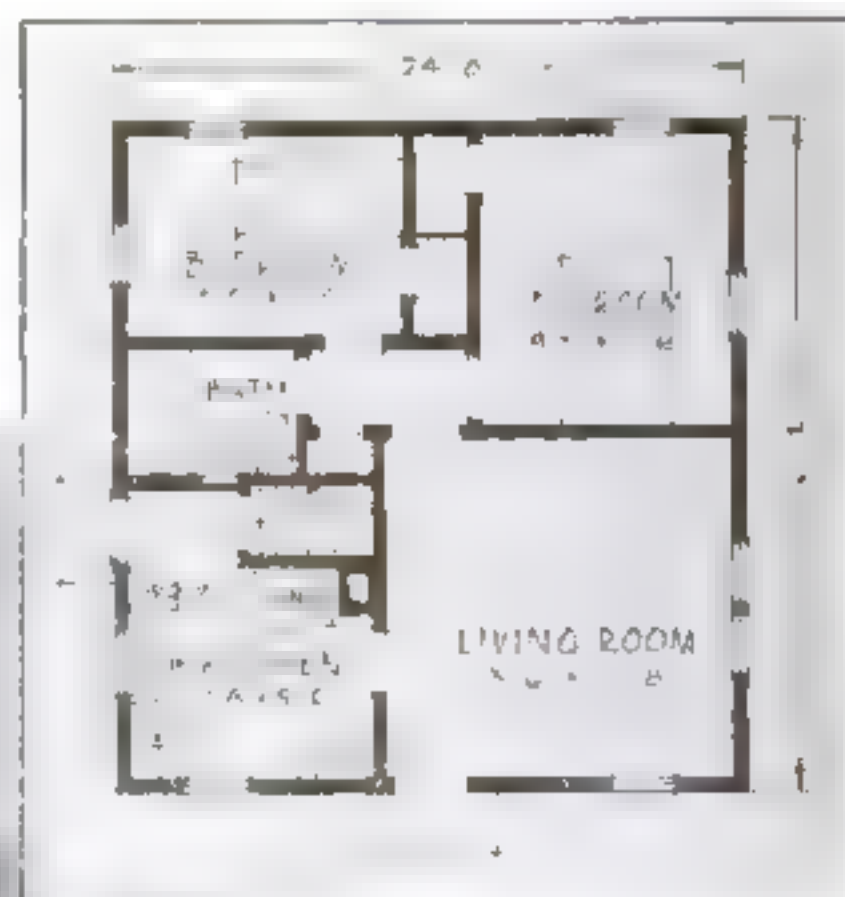
**N**OW you can own a home! To demonstrate the truth of this statement, lumber dealers in 1,000 communities throughout the United States soon will throw open to the public 3,000 small homes ready to use.

These homes will not be freaks in any sense of the word. Ordinary materials and ordinary construction methods which time has shown to be sound, combined with careful design and workmanship, will be employed throughout. The 1,000 demonstration units will consist of three homes each, a one-story residence and two that have two stories. Selling prices will range from \$2,000 to \$4,500, and financial details can be arranged so that any person with an income of \$1,200 to \$2,500 a year can afford to own one.

The nation-wide demonstration, designed to bring small homes within the

reach of almost everyone, really got its start when the Federal Housing Administration decided to prove that attractive small homes can be built at reasonable costs. An exhaustive report was prepared, pointing out how a few thousand dollars would buy comfortable, well-built houses adequate to the needs of about seventy-one percent of the population.

"It can't be done!" some experienced builders declared, while others said that the idea sounded reasonable. So, in order to put the *(Continued on page 15)*



Floor plan of the house pictured above, one of three model homes built at Bethesda, Md., as examples of the type of construction possible at low cost. The living room is shown at the left. The house cost only \$3,403.81, including a \$666.81 lot





## HOMES FOR EVERYBODY

(Continued from page 14)



"House D," another of the demonstration homes. It has two stories and cost \$3,406.80

scheme to a laboratory test, the National Lumber Dealers Association undertook the construction of three demonstration homes at Bethesda, Md., a suburb of Washington, D. C.

Following the Federal Housing Administration plans to the letter the lumber men bought the lots, let the contracts, and otherwise carried out the work through ordinary channels, just as any home builder would have to do. The result was that the houses were put up at costs within a few dollars of the estimate. Before the demonstration period had closed, 500 people wanted to buy the sample homes.

If this idea of building houses at really reasonable figures worked in Washington, it ought to work in other parts of the country, the lumber men decided. Local lumber dealers from Maine to California thought so too; and so the 1,000-demonstration project was undertaken. Plans were made and simultaneous construction of the 3,000 houses was begun on March 1 of this year. According to forecasts, the dwellings will be ready for inspection by May 1.

At the present time, housing facilities in the United States are some 2,000,000 homes behind requirements, while 750,000 more houses will be needed each year for the next ten years in order to take care of normal demands. In other words, if 2,750,000 new houses were to be built this year, the housing situation would be merely normal, and (Continued on page 16)



Carpenters erecting the roof of the house illustrated above. Standard methods are used.

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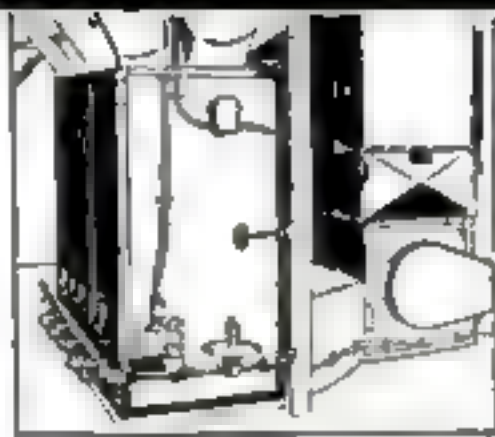


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## HOMES FOR EVERYBODY

(Continued from page 15)



"House E," another two-story model structure. Its cost, with lot, was only \$3,855.80

another 750,000 would be needed in 1938. So the 3,000 demonstration homes will be merely a drop in the housing bucket.

The first demonstration houses built at Bethesda are of wood construction throughout, and have excavated basements. "House E" is a two-story structure measuring twenty feet three inches by twenty-two feet on the foundation, and has a living room, dining room, kitchen, three bedrooms, and a bath. The cost to build it was \$3,855.80, including the lot and the contractor's profit.

"House B" is a one-story, four-rooms-and-bath residence measuring twenty-four feet eight inches by twenty-six feet four inches on the foundation. The cost of this house, including a \$666.81 lot and the contractor's profit of \$274, was \$3,403.81.

The third unit "House D," has two stories and measures sixteen feet by twenty-four feet four inches on the foundation. It has a kitchen, living room, and dining alcove on the first floor, and two bedrooms and a bath on the second. Its cost, including lot and contractor's profit, was \$3,406.80.

An interesting fact is revealed by studying the costs of these three homes: It cost but \$2.99 more to put up a two-story house (Continued on page 17)



A construction detail of the sample homes—paper used around a window for windproofing



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"Psychiana," this new psychological religion, believes and teaches that it is today possible for every normal human being, understanding spiritual law as Christ understood it, "to duplicate every work that the Carpenter of Galilee ever did"—it believes and teaches that when He said, "the things that I do shall ye do also." He meant what He said and meant it literally to all mankind, through all the ages.

Dr. Robinson has prepared a 6000 word treatise on "Psychiana," in which he tells about his long search for the Truth, how he finally came to the full realization of an Unseen Power or force "so dynamic in itself that all other powers and forces fade into insignificance beside it"—how he learned to commune directly with the Living God, using this mighty, never-failing power to demonstrate health, happiness and financial success, and how any normal being may find and use it as Jesus did. He is now offering this treatise free to every reader of this magazine who writes him.

If you want to read this "highly interesting, revolutionary and fascinating story of the discovery of a great Truth," just send your name and address to Dr. Frank B. Robinson, 447-5th Street, Moscow, Idaho. It will be sent free and postpaid without cost or obligation. Write the Doctor today.—Copyright, 1935, Dr. Frank B. Robinson.

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## HOMES FOR EVERYBODY

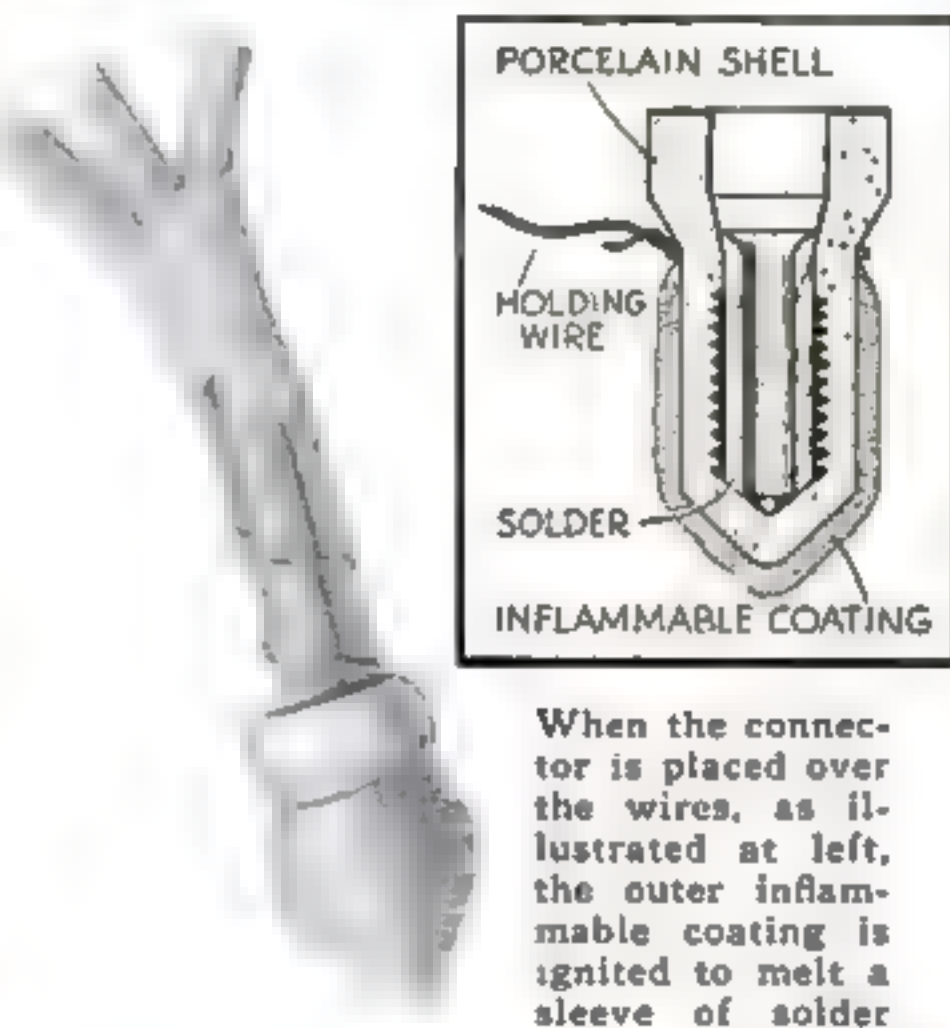
(Continued from page 16)

(house D) than it did to build a single-story one (house B) having less usable space!

In addition to these three types of houses, detailed plans have been worked out for other small homes costing as little as \$1,200, which can be paid for almost painlessly by the man of modest salary. Although he has to have a small percentage of the cost of house and lot ready as a down payment, before he starts construction, he can pay the remainder out of his income in small monthly amounts over a long period of years.

Lumber dealers sponsoring the nationwide building demonstration have asked manufacturers of home equipment to provide plumbing fixtures, refrigerators, heating plants, electrical equipment, and other modern necessities at a price and of a size to match the low-cost homes.

## CONNECTOR MAKES OWN SOLDERED SPLICES



WITH a self-soldering connector now on the market it is said to be a simple matter to make insulated, soldered splices in the wiring of outlet boxes and electric fixtures. Consisting of a porcelain shell lined with solder and coated with a special inflammable material, the connector is simply placed over the wires to be spliced and ignited with a match. As the coating burns, the heat generated melts the solder. Flowing around the wires and into grooves in the interior surface of the shell, the solder forms a permanent splice which is insulated by the porcelain cap. A temporary "holding wire" attached to the connector can be wound around the wires, as shown, to hold the shell in place while the match is applied.

## CRACK-CLEANING TOOL FOR PLASTER REPAIRS

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## HOME OWNERS' IDEAS

(Continued from page 17)

crack and moved along like a scraper, it quickly cleans out all loose material and forms a neat V-shaped groove to take the new plaster. The cutter can be used in any crack up to five sixteenths of an inch in width.



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## Questions

FROM HOME OWNERS

Q.—OUR front lawn is marred by numerous ant hills. What is a good way to destroy these unsightly nests?—J. L. F., Poughkeepsie, N. Y.

A.—POUR a little carbon disulphide, a chemical which can be obtained at practically any drug store, into the nest opening and then stamp on the hill to seal it. The fumes will penetrate throughout the tunnels and chambers of the nest, killing larvae as well as adult ants.

### How To Set a Loose Knife

G.L., SARATOGA SPRINGS, N.Y. To set a loose knife, first remove it from its handle. Mix two parts of powdered resin and one part of precipitated chalk, and stuff it into the handle. Heat the blade, holding it with a (Continued on page 19)

# Wood Carving AND WHITTILING

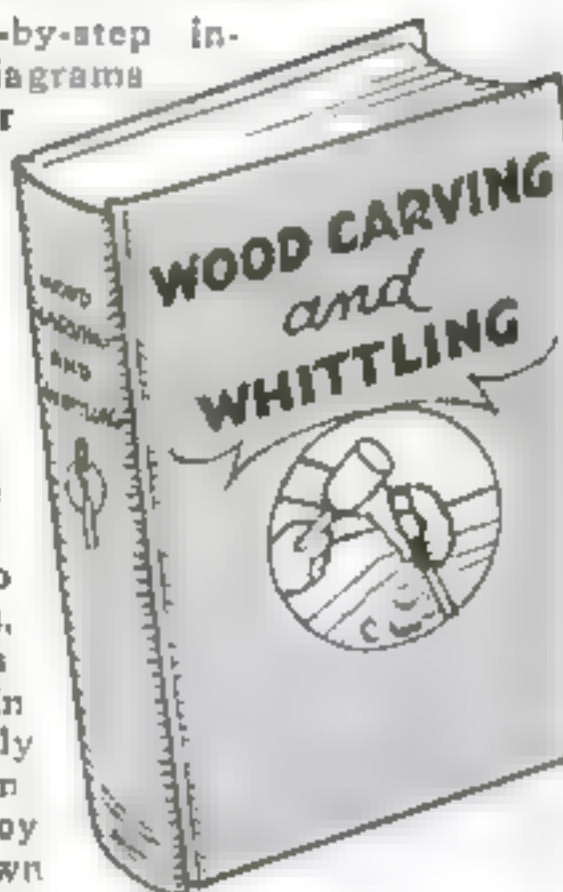


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## QUESTIONS FROM HOME OWNERS

(Continued from page 18)

pair of pliers, and then push it into the powdered material. The heat will melt the mixture, which will hold the knife firmly when it cools.

### Finding Leaks in Gas Pipe

Q.—WE HAVE noticed a slight odor of gas in the kitchen for some time but have been unable to determine the source of the leak around the stove. I have tried running a lighted match along the pipes without success. Can you suggest any other way of locating the leak?—C.R.B., Toronto, Ont.

A.—It is always dangerous to attempt to locate gas leaks with an open flame. Try applying soapy water along the pipes and joints. Using a flash light to illuminate dark corners, look for bubbles, which will indicate the location of the leak without danger.

### Removes Rust from Nickel

B.D.O., BUFFALO, N. Y. Rust spots can be easily removed from nicked surfaces by applying ordinary petroleum jelly and then rubbing it off, after several days, with a rag that has been dipped in ammonia.

### Glass Cut With Scissors

V.K., HELENA, MONT. Although a smooth edge can not be expected, it is possible to cut a sheet of glass roughly to any desired shape with an ordinary pair of scissors, merely by doing the work while the glass is held underwater in a wash bowl or bath tub. The water keeps chips from flying about.

### Keeps Flies Out of Paint

L.R.C., JEFFERSON CITY, MO. Flies and other insects can be kept away from freshly painted surfaces by mixing a small amount of bay, or laurel, oil in with the paint before it is applied.

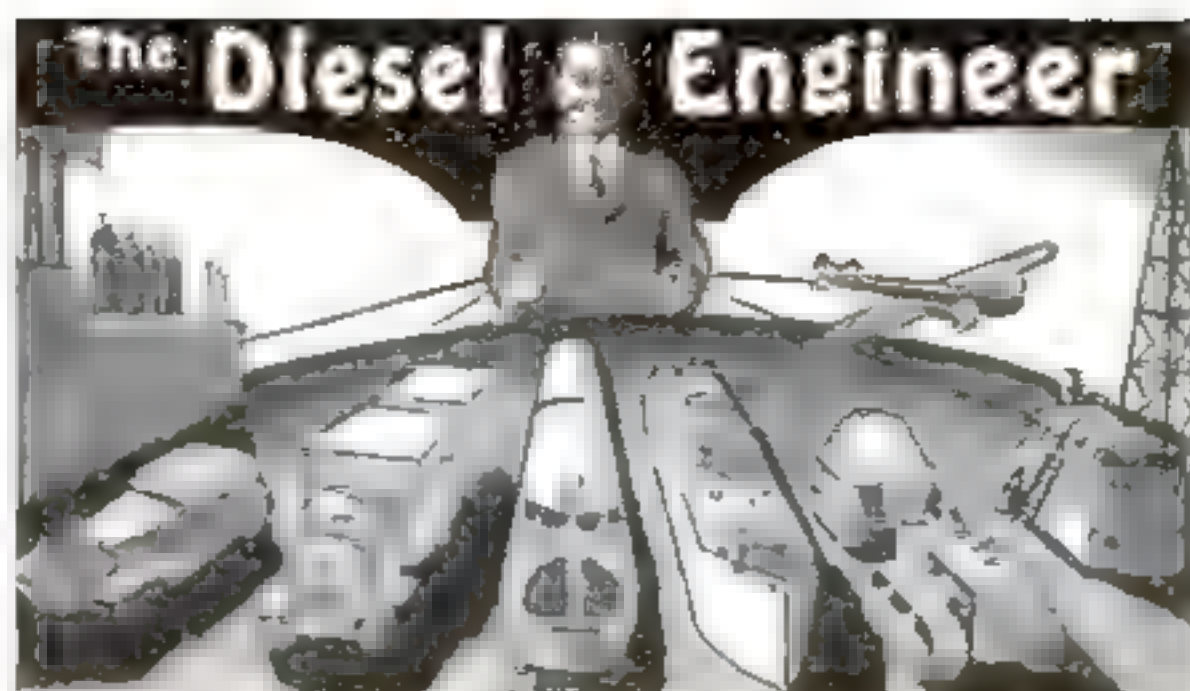
### When Glass Stoppers Stick

Q.—THE glass stopper in an antique carafe is stuck so firmly that I don't dare force it for fear of shattering the glass. Can you suggest a way to loosen it?—N.R.M., Greenfield, Mass.

A.—Mix two parts of alcohol with one part of glycerine and one part of common table salt. Let this soak in around the stopper where it meets the bottle neck. After a few hours, a gentle tap should loosen the stopper with little likelihood of injuring the bottle.

### Spots and Stains on Carpets

D.C.K., SIOUX CITY, IOWA. A handy way of removing ordinary spots and stains from a carpet is to place a dish under the soiled spot and drain carbon tetrachloride, or other good cleaner, through the fabric and into the dish.



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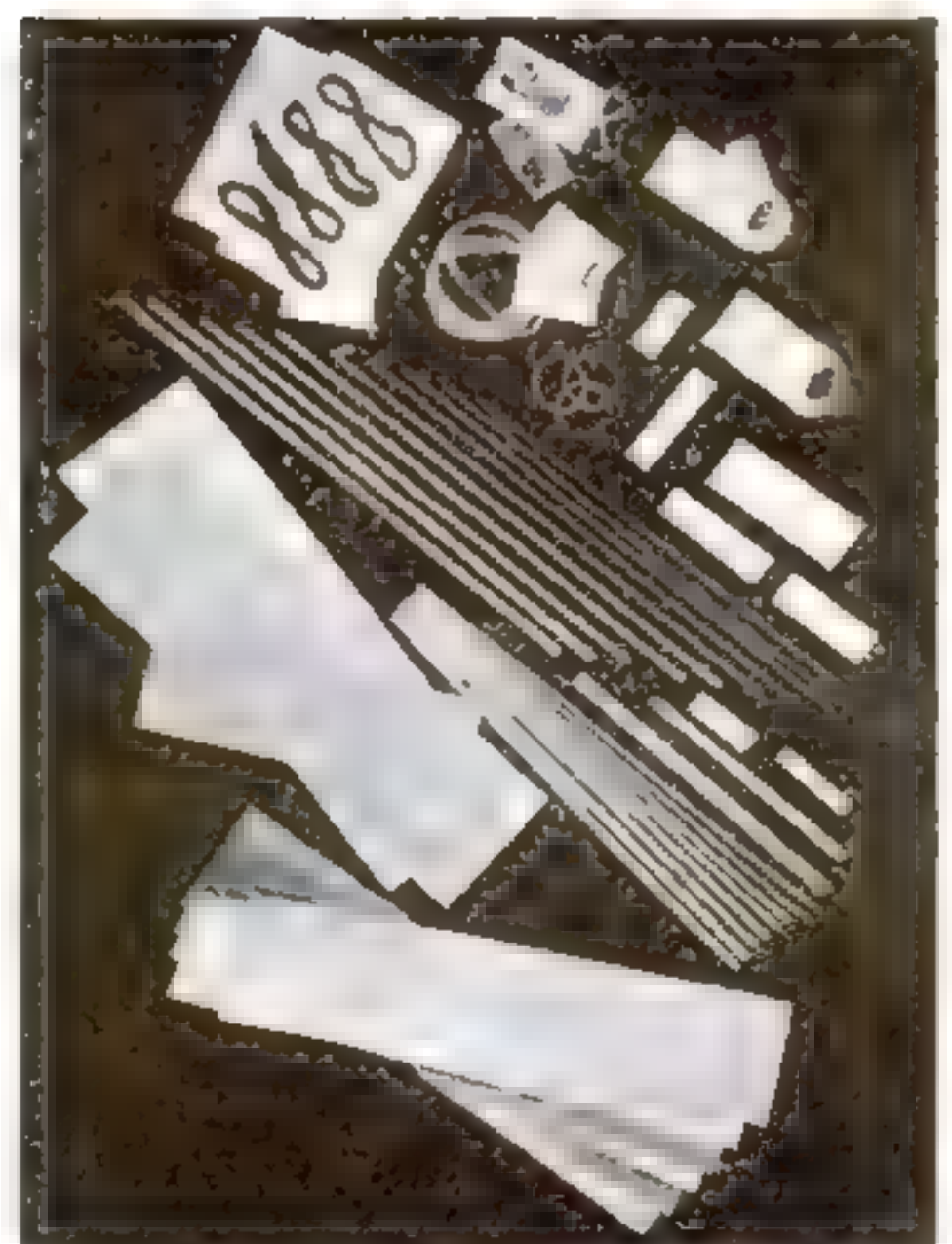
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## New Brig Model CAN BE BUILT TWO WAYS

**B**UILDING a ship model is a fascinating hobby, especially when you are constructing a brig such as the *Malek Adhel*, illustrated above. It is the latest model designed by Capt. E. Armitage McCann. The original two-masted square-rigged vessel of that name was built in New York in 1840 for trade in the Pacific Ocean, and every lover of models will want to have its miniature counterpart on the mantel, in his den, or displayed in some other place of honor. It has a 20-in. hull and is 33 in. long over all.

For the benefit of readers who wish to build this model, we have prepared two types of construction kits containing all the raw materials. Those preferring to make a scale model



**KIT 6S**—All the materials necessary for building a planked-hull model of the brig

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(Continued on page 21)



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**OUR CONSTRUCTION KITS**  
(Continued from page 20)



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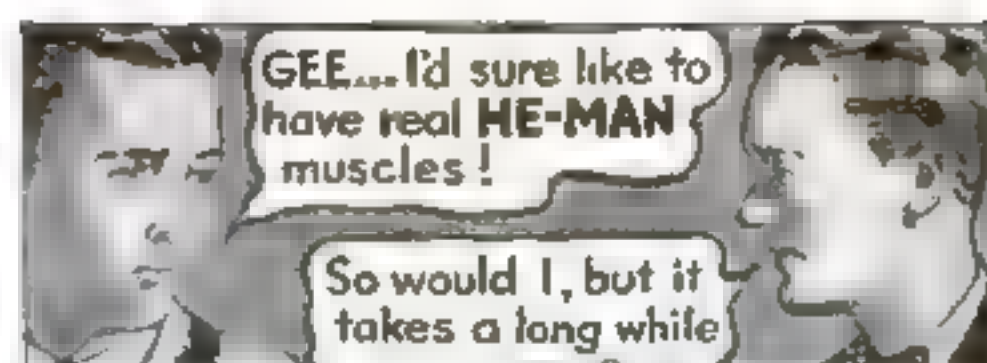
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(Continued on page 22)



KIT U—*Hispaniola* of "Treasure Island"



—says Charles Atlas

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(Continued from page 21)

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## URGE NEW MEDICINES TO BE BREATHED

BREATHING medicine into the system instead of swallowing it, or having it injected, is a plan under discussion at the French Academy of Medicine in Paris. Advocates of the idea point out that the respiratory system is the one part of the body that is always at work, and the route most easily and conveniently available for the absorbing of medicines. Ether and chloroform are given by breathing, and chlorine gas has been used similarly in the treatment of colds. All the recently devised synthetic drugs, however, such as the "pain killers," aspirin and acetanilide; phenolphthalein, a laxative; and novocaine, a local anesthetic, are taken either by injection or through the stomach. Gaseous medicines, according to the new French idea, would be administered by placing the "dose" of healing vapor in a small room with the patient, or by mixing it with air breathed through a mask-like arrangement working on the principle of the familiar oxygen tent.

## FLOUR MADE FROM FISH HAS HIGH FOOD VALUE

BREAD FLOUR that contains fish, without that food's characteristic taste and odor is the latest achievement of Japanese scientists. A general decline in health has been traced to the increasing use of "Americanized" meals of coffee and toast or bread and jam, instead of the traditional dish of rice and fish, and the new fish bread has been developed to retain the nutritive value of the old diet without an attempt to reform the eating habits of the nation. By grinding the dried flesh of fish, and soaking the powder in four separate baths of alcohol, a delicate, palatable fish flour results. It is readily mixed with wheat flour to make a light loaf of bread. Experiments on animals over a period of five years are said to have proved the value of a diet including this type of food, and it is hoped that the new bread will be adopted by the majority of Japan's people.

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MAY 1937

POPULAR SCIENCE

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RAYMOND J. BROWN, Editor



# New Cities IN THE ARCTIC

MARK FRONTIER OF RUSSIA'S POLAR EMPIRE



SOMEWHERE over the white expanse of the arctic, as this is written, a mighty eight-ton, twin-motored plane is roaring through the darkness of the long polar night. Five Russian airmen aboard it are winging their way from Moscow across southern Siberia to a point within a few miles of Alaska, and back again along the northernmost rim of Asia. They are the first to dare a complete circuit of the far north in winter, when the fitful northern lights, painting the jagged ice crags of the frozen arctic sea with fantastic colors, may be the only illumination to guide them. If they arrive safely, they will have demonstrated the practicability of a dream of Soviet aeronautical engineers—a commercial air line linking the United States and Russia across the polar regions!

Stretch a string across a globe from Alaska to Moscow, and you will under-

stand the attractions of the transpolar air route. The total distance measures scarcely more than half again the length of the overwater jump that our clipper planes make regularly between San Francisco and Honolulu. To be sure, the great-circle route crosses regions so forbidding that only polar explorers have reached them. But slacken the string

*Modern pioneers of the north, explorers and engineers plant colonies as way stations for plane and steamer routes across the roof of the world*

By

ALDEN P. ARMAGNAC

Street scene in Bulun, a new settlement located on the Lena River in the far north. At top, the famous Soviet ice breaker *Krassin*

only a little, and it grazes the Siberian coast of the Arctic Ocean, newly dotted with settlements and air bases.

That is the route that a pair of Russian trail blazers pioneered last summer, when they flew from California to Nome, Alaska, and thence to Archangel and Moscow by the light of the midnight sun. Now the crew of the huge Soviet monoplane N-120 have undertaken to battle the rigors of winter darkness and cold along the same path. In case of a forced landing, tents and sleeping bags carried aboard the plane will protect them from the temperatures of forty to seventy degrees below zero that they expect to encounter. From a special tank installed in the tail of the



plane, boiling water can be pumped to warm its motors. Scientific instruments mounted in the craft will gather valuable data for the proposed air liners of the future.

In this dramatic fashion the Russians give notice that they are ready to open to the world a vast arctic empire. Picture a frozen expanse two thirds the size of the United States, reaching from the north pole to the northern coast of European Russia, and down into Siberia to the sixty-second parallel—equivalent, in this hemisphere, to the latitude of the south-

ern tip of Baffin Land. Through a "Central Administration of the Northern Sea Route" assigned to develop it, this is the territory that the Soviet Government has won from the arctic and is turning into a habitable and productive land.

Steamships convoyed by ice breakers and airplanes are negotiating for the first time the "impossible" passage through the ice-choked Arctic Ocean. Exploring parties, paving the way for colonists to follow, have established the northernmost scientific observatories and radio stations in the world. Prospectors have discovered fabulous deposits of rare minerals, including a gold field richer than Alaska in its boom days. Whole settlements of pioneering men and women have been transported to the Siberian border of the polar sea and deposited there, complete with houses, live stock, boats, and radio equipment to keep them in touch with the rest of the world. All these activities,

with the pioneering of the polar air route, form coördinated parts of a program of arctic development without parallel in history.

A single, well-organized polar expedition might creditably sum up, for the year, a nation's entire effort at arctic exploration. Last year and the year before, the Soviet Government had more than two score expeditions in the field—including geologists, hydrographers, meteorologists, naturalists, soil engineers, and mining and fishing experts.

Here is something new to science—polar exploration on a national scale. Results of privately financed expeditions necessarily are limited, for the cost of ships and planes brings the expense of just one venture like the first Byrd Antarctic Expedition to more than \$1,000,000. Picture, in contrast, the intensive efforts of dozens of bands of arctic experts backed by no less than \$100,000,000 of government funds. That the investment is paying big dividends is apparent from reports of riches that have been found—platinum, gold, silver, precious stones, amber, copper, nickel, asbestos, graphite, phosphate, salt, coal, and oil, to be added to the wealth of Siberia's furs, lumber, fish, and grain. Vague tales of such mineral treasures have been brought back from the arctic for centuries. Now the Soviet explorers are leading the way to them.

That the newly discovered gold fields of the Kolyma region of northeast Siberia surpass Alaska in its richest days is no mere boast of an optimistic Soviet enthusiast. The statement has the official authority of our own Department of Commerce. According to its recent report on this Siberian Klondike, more than 500 miles of motor road have been built to exploit the "strike," and a distance that took a month to cover in 1932 can now be traversed in two days.

Petroleum has been found on the rim of the arctic, oil derricks have risen, and gasoline and kerosene are being produced by the northernmost refinery in the world. Coal for the bunkers of ships plying the Arctic Ocean is being mined along the strait between Novaya Zemlya and the mainland, and on the Norwegian island of

A giant radish of a type developed for cultivation in the arctic, compared with one of a variety not suited to the north



Icy gales are harnessed to windmills like this to furnish light and power for the lonely outposts



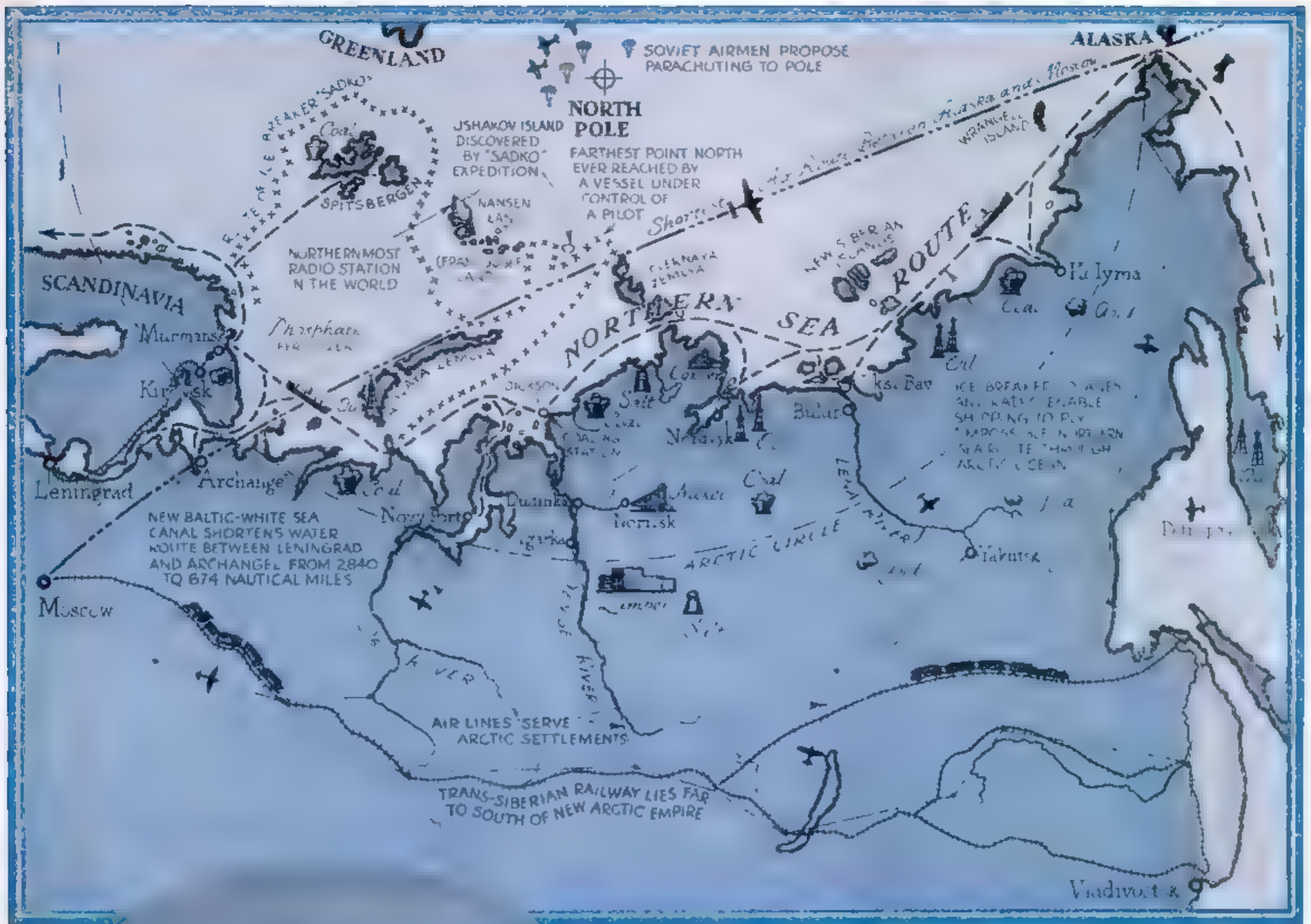
#### COAL FROM UNDER THE ARCTIC ICE

Above is a scene in one of the coal mines that supply fuel for steamers plying the northern sea route between the North Cape of Norway and the Bering Sea

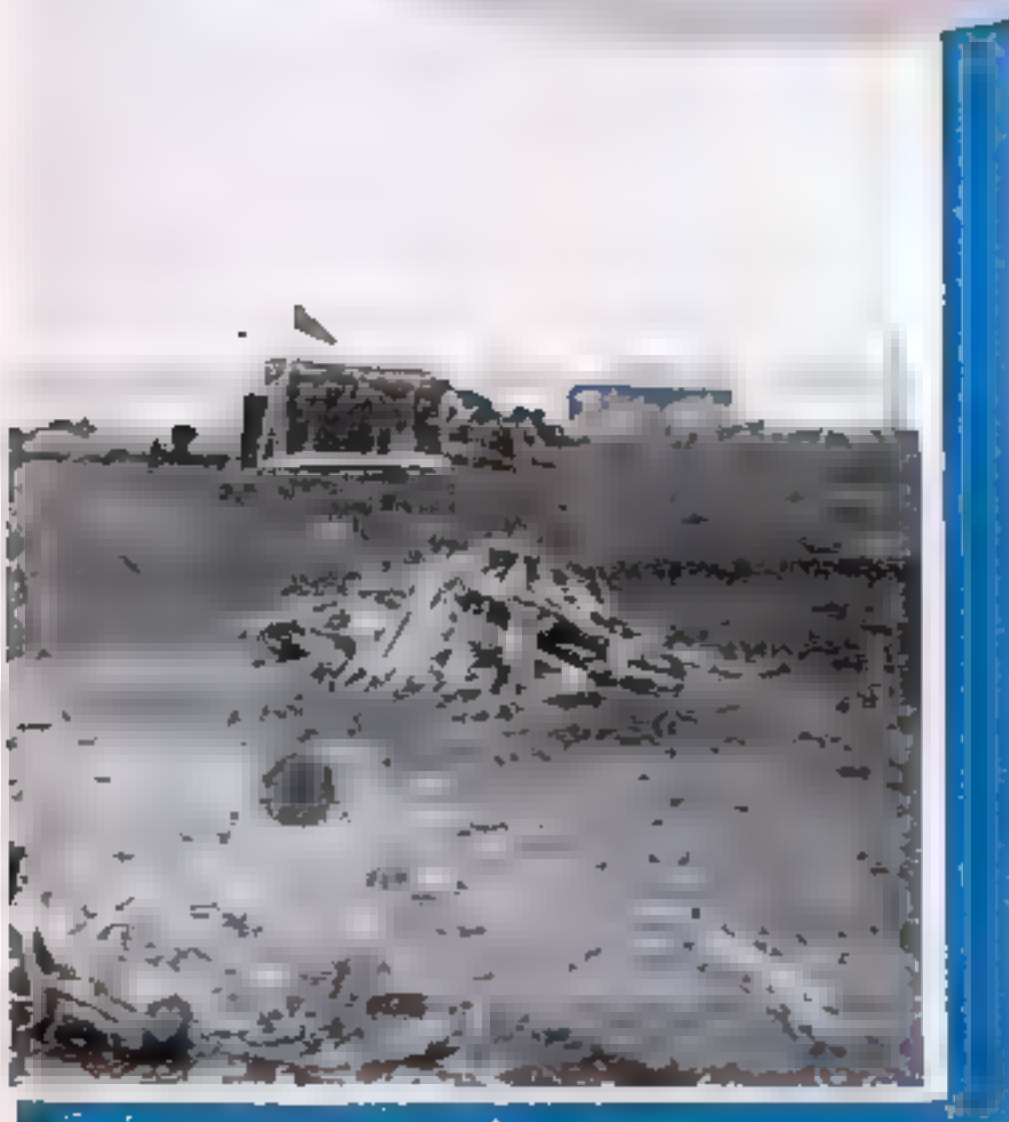


A seaplane refueling at Tiksi Bay, a new colony established at the mouth of the Lena River in Siberia to serve





Russia's new polar empire, showing the northern steamship route and proposed Moscow-New York air line. At left, a movie theater above the arctic circle



as a seaport for Arctic Ocean commerce

Spitsbergen, where Russian mines operating under a concession from Norway are reported to have taken out half a million tons last year.

Russia had to import phosphate for fertilizer, until geologists discovered deposits near Murmansk that are estimated to contain 960,000,000 tons of the valuable ore! Now the Soviet Union supplies

not only its own needs, but world markets as well. Within the arctic circle, amidst a snowy waste once populated only by a few nomadic Laplanders, the find has created the bustling city of Kir'ovsk with 40,000 inhabitants. Modern apartment houses, hospitals, schools and a talkie theater seating an audience of 1,200 have been erected at a latitude where the night is a month and a half long, and the sun shines almost unbrokenly for an equal period during the summer. A 48,000-kilowatt hydroelectric plant, the world's northernmost, has been placed in service on the Tuloma River near-by. It supplies current for the electrified railroad that carries the product of the phosphate mines to the principal arctic port of Murmansk, exceptionally favored by its freedom from ice.

Lumber has created another arctic me-

tropolis, the inland port of Igarka on the great Yenisei River. In 1928, Igarka had a population of just forty-three persons. Today it numbers 20,000. British sailors from tramp steamers mingle with Russian workers in the city's wooden-paved streets. Ice breakers, airplanes, and radio have brought Yenisei River ports within eighteen to twenty days' sailing of London, Rotterdam, and Hamburg. Last year Igarka's sawmills cut up somewhere in the neighborhood of 1,000,000 trees, and yet had used up only two percent of the lumber that can still be taken from the district before it will need reforestation.

Dropping cities bodily in the arctic, the Soviet Union has established ports all along its Northern Sea Route. The hardship of their pioneer men and women is well illustrated by the founding of Tiksi Bay colony. In the summer of 1933, the settlers arrived aboard a steamship convoyed by the ice breaker *Krassin*. Unloaded with their supplies, they hastened to complete their village before the polar winter and its furious storms were upon them. Lumber that was to reach them on barges from Yakutsk, via the Lena River, failed to arrive. The river had frozen early and blocked the boats. So the colonists built their first structure, a bake shop, from driftwood, and took their meals of hot soup and porridge aboard an anchored barge that served as their kitchen. Tents heated by portable iron stoves, with pipes wrapped in asbestos and stuck





A caravan of the north—the ice breaker *Krassin*, at right, conveying a fleet of steamers through the flocs. Such convoys will keep the northern sea route open in the summer months



Pioneers of the Tiksi Bay colony smoking in their tent during the long night of the arctic winter



A woman cowherd tending cattle at the Barentsburg mines, a Soviet settlement on the island of Spitsbergen



Driven by an air propeller, this odd amphibian craft, designed for use in the arctic, has sled-like runners under its hull so that it can travel over ice and snow as well as in the water

through the canvas, shielded them from the bitter cold until they could scrape together enough wood to build houses. After back-breaking work they were ready for the arctic night in comfortable dwellings with three-tiered bunks, electric light, and radio.

Today Tiksi hums with the activity of a modern seaport. Wooden buildings, street lamps, and telegraph poles line its principal street. The structures include a dining hall for 250 settlers, a school for Tiksi's twenty children, and a hospital. A radio station transmits 16,000 words a day. The arctic has been beaten—though far from tamed, for tenders of the radio shack still lash themselves together with a life line, like mountain climbers, before they venture into shrieking polar gales to fetch driftwood for fuel or to read exposed meteorological instruments.

High wages and love of adventure attract pioneers to settlements like Tiksi Bay and Nordvyk, established last summer by four vessels from Archangel and one from Vladivostok. First arrivals include only what the Soviet calls "producers"—engineers, miners, doctors, scientists, mechanics, and, among the women, machine operators, scientific assistants, and cooks and waitresses for the community dining room. The following year, after the colony is set up and running smoothly, the men may bring their wives and families.

So well have medical experts conquered the problem of arctic life that children born above the polar circle enjoy exceptional health—unless they visit the south, where they quickly fall prey to infectious diseases against which they have built up no resistance in the germ-free northern air. Polar colonists get special diets, a monthly medical examination, and regular ultra-violet-ray treatments during the long arctic night.

Farming in the arctic supplies fresh vegetables whose vitamins ward off the dread disease of scurvy, from which earlier explorers perished. Potatoes, carrots, beets, cabbages, kohlrabi, peas, and cucumbers are being grown on more than 6,000 acres of subpolar land. At experimental stations within the arctic circle, scientists are crossing imported seed with native varieties to create new strains of vegetables and berries especially suited to northern cultivation. Already they have produced many types that mature with the needed rapidity in the short, arctic summer. Windmills of new design harness polar gales and generate electricity to warm and light hot-houses at these experimental agricultural stations.

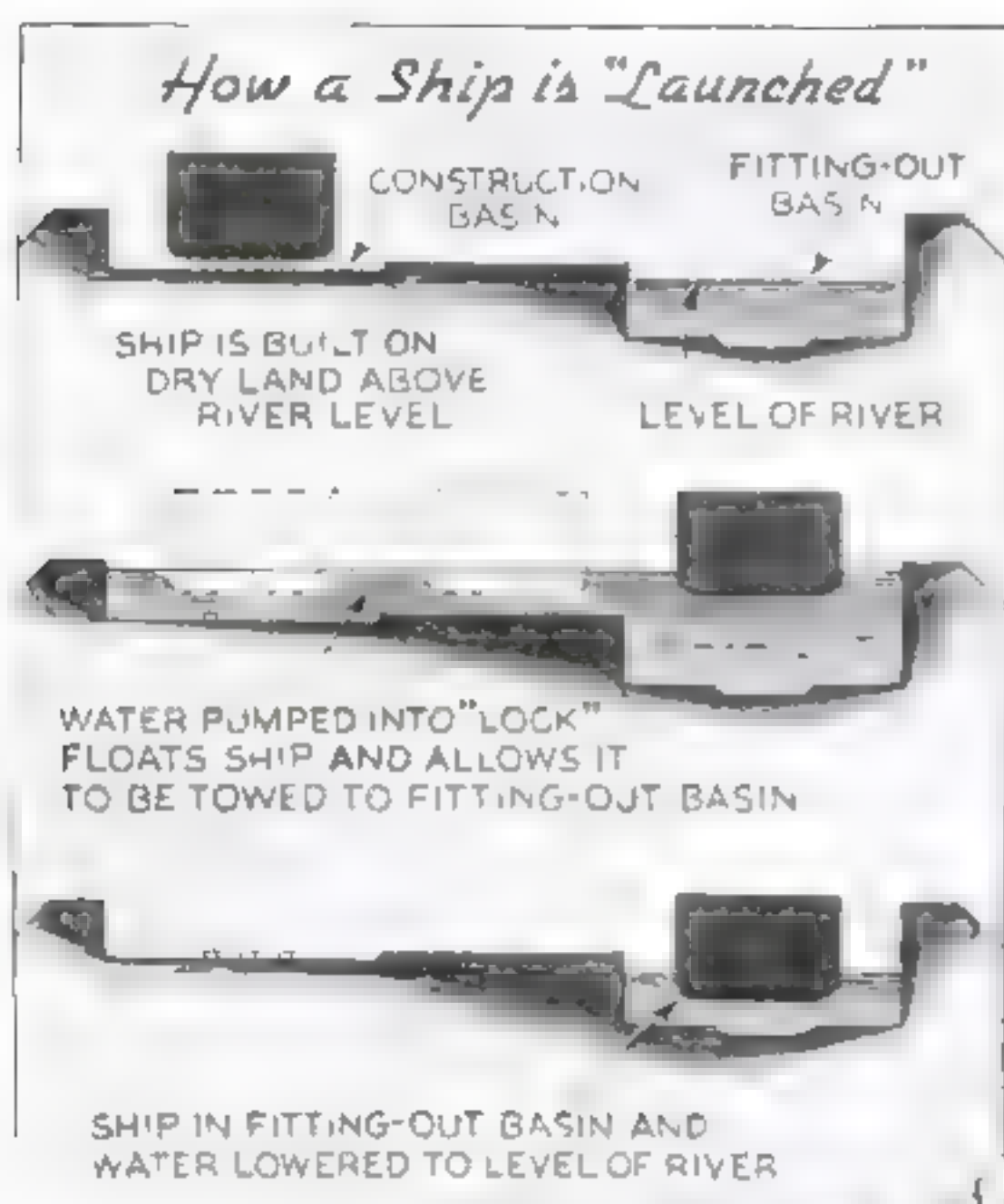
Hand in hand with this program has gone what the Soviet considers its greatest arctic achievement—the opening of the Northern Sea Route across the Arctic Ocean from the Atlantic to the Pacific. Only six years ago an eminent arctic expert declared this maritime passage, skirting the pole, "cannot be of any practical importance in our geological epoch." But its conquest was vitally important to tap the riches of the arctic realm, so instead of waiting a few million years to see whether the climate would change and the Arctic Ocean would thaw out, Soviet ships went ahead and sailed it anyway!

How has it been done? No longer do vessels trust to luck to find cracks in the ice, as those of early explorers did. From gale-swept outposts set up all along the bleak arctic coast, a chain of radio stations flashes last-minute weather reports to arctic navigators. Airplanes zoom ahead of their vessels to pick the best way through the ice fields. With a powerful ice breaker in the lead, a string of a dozen merchant

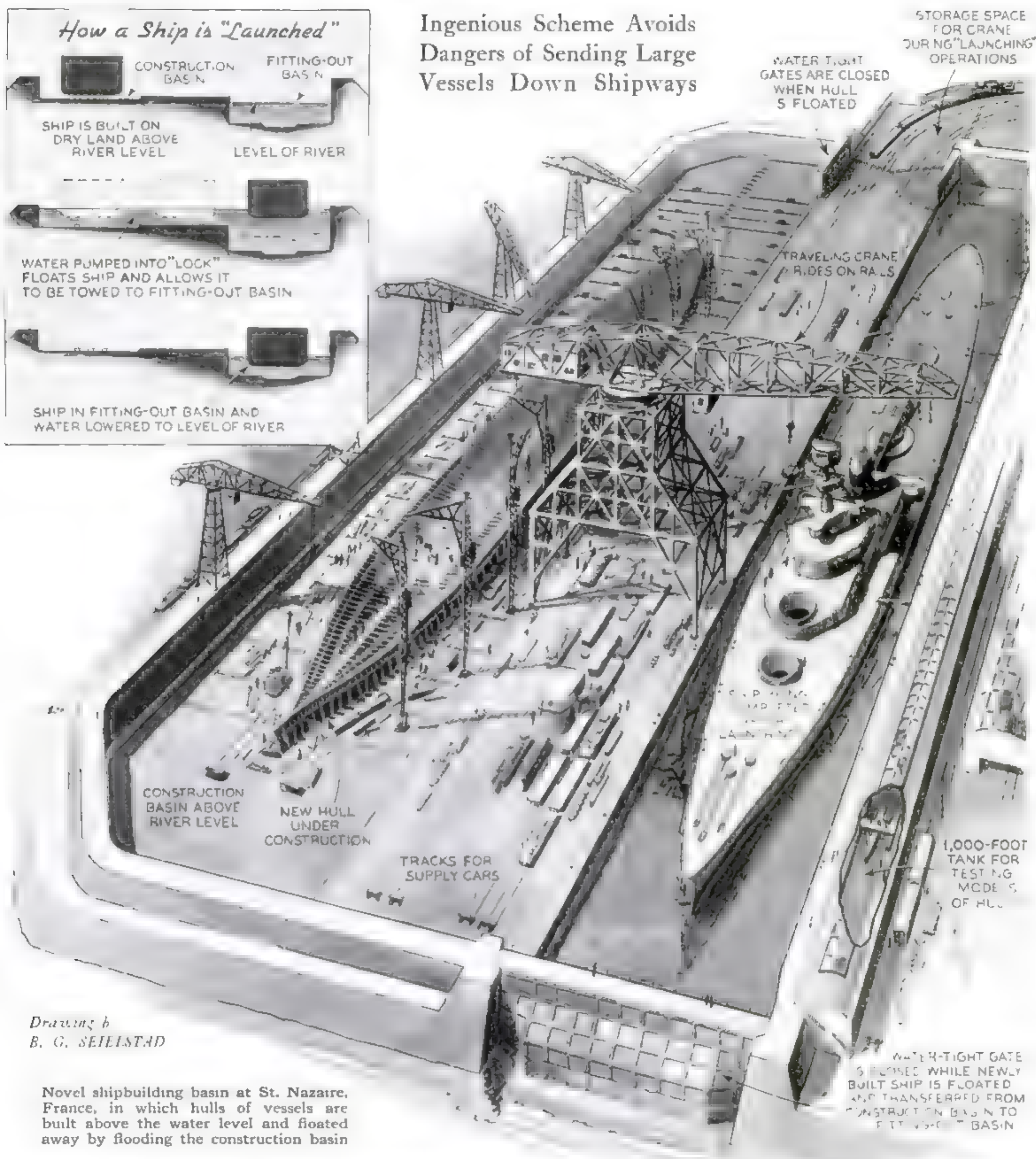
(Continued on page 104)



# Huge Dock "Launches" Ships



Ingenious Scheme Avoids Dangers of Sending Large Vessels Down Shipways



Drawing by  
B. G. SEIELSTAD

Novel shipbuilding basin at St. Nazaire, France, in which hulls of vessels are built above the water level and floated away by flooding the construction basin

**D**READNOUGHTS and ocean liners, built on dry land, now can take to the water without being subjected to the peril of sliding down launching ways, through an ingenious engineering scheme perfected by a firm of French shipbuilders.

At the mouth of the river Loire, the concern has constructed a monster "lock" more than 1,000 feet long and 400 feet

wide. Nearly half the area within the water-tight wall of the inclosure, lying ten feet above the river level, constitutes a construction basin where the shipbuilders perform all the work that ordinarily precedes launching a vessel. A deeper section, which is flooded by the Loire when a water-tight gate is opened, acts as a fitting-out basin for final work such as the installation of heavy machinery.

When an ocean giant is ready for its "launching," engineers close the gate to the river and start pumps feeding water into the entire lock. As the water level rises, the ship floats, permitting it to be towed into the fitting-out basin. The water is then allowed to run back to the river, lowering the ship to river level. When work is completed, the gate is opened, and the vessel passes through it into open water.



# Boy Scientists

MAKE ASTOUNDING NEW DISCOVERIES



**BOY STARGAZER**  
Peering through a borrowed telescope, Leon Salanave, San Francisco schoolboy, observed fluctuations in a variable star and notified astronomers

## YOUNG CHEMISTS

Robert Snelling, left, and his brother William in their basement laboratory at Allentown, Pa., where they manufacture inks of many kinds for sale

**I**N A cellar laboratory, hard by the laundry tubs, nine-year-old Robert Snelling, of Allentown, Pa., pours a dark fluid into a test tube under the careful supervision of his brother William, eleven. After close scrutiny of the blue-black liquid, Robert nods approval and dumps it into a gallon jug labeled "Best Permanent Iron-Gallo-Tannate."

This is a daily procedure, for the Snelling brothers are scientific ink specialists, manufacturers and purveyors of several different grades of writing fluid which they sell to stores, offices, hotels, and schools in several states. William is senior chemist and president of the firm; Robert is first laboratory assistant and vice president. A recent financial report of the Snelling Chemical Ink Company showed a total income of \$700 in one year.

From coast to coast, and from the Great Lakes to the Gulf of Mexico, other American youngsters are delving in varied fields of science. The records disclose youthful specialists, from six to sixteen years of age, who have achieved recognition in aviation, astronomy, mathematics, metallurgy, biology, taxidermy, zoölogy—in a list of research fields that runs literally from A to Z. They form the junior battalion of science in which innovators and discoverers are making a start.

At Columbia, S.C., a few years ago, Robert Lewis, a newsboy who spends his evenings peering through a homemade telescope, "scooped" the biggest observatories in the country. He was the first American to see the strange expanding star, Nova Herculis, which increased in brightness from night to night. Dr. Harlow Shapley, head of the astronomy department at Harvard University, called this occurrence, far out in space, "one of the most important stellar outbursts ever witnessed."

The telescope that Lewis used cost him

exactly \$31.18, plus a year's labor and countless trips to the junk yard for parts and materials. It took him eight months to grind the lens. Experts state that a ready-made instrument of like quality and power would cost about \$1,500. As a result of his work, the young stargazer has been awarded a scholarship in astronomy at the University of Virginia.

While the achievements of this newsboy-astronomer are spectacular, they are by no means the only ones made by youthful stargazers. Not long ago, a high-school student in San Francisco, Calif., reported a fluctuation in a star whose apparent brightness had not varied in ten years, and hundreds of juvenile observers turn in periodic star reports annually to the major observatories.

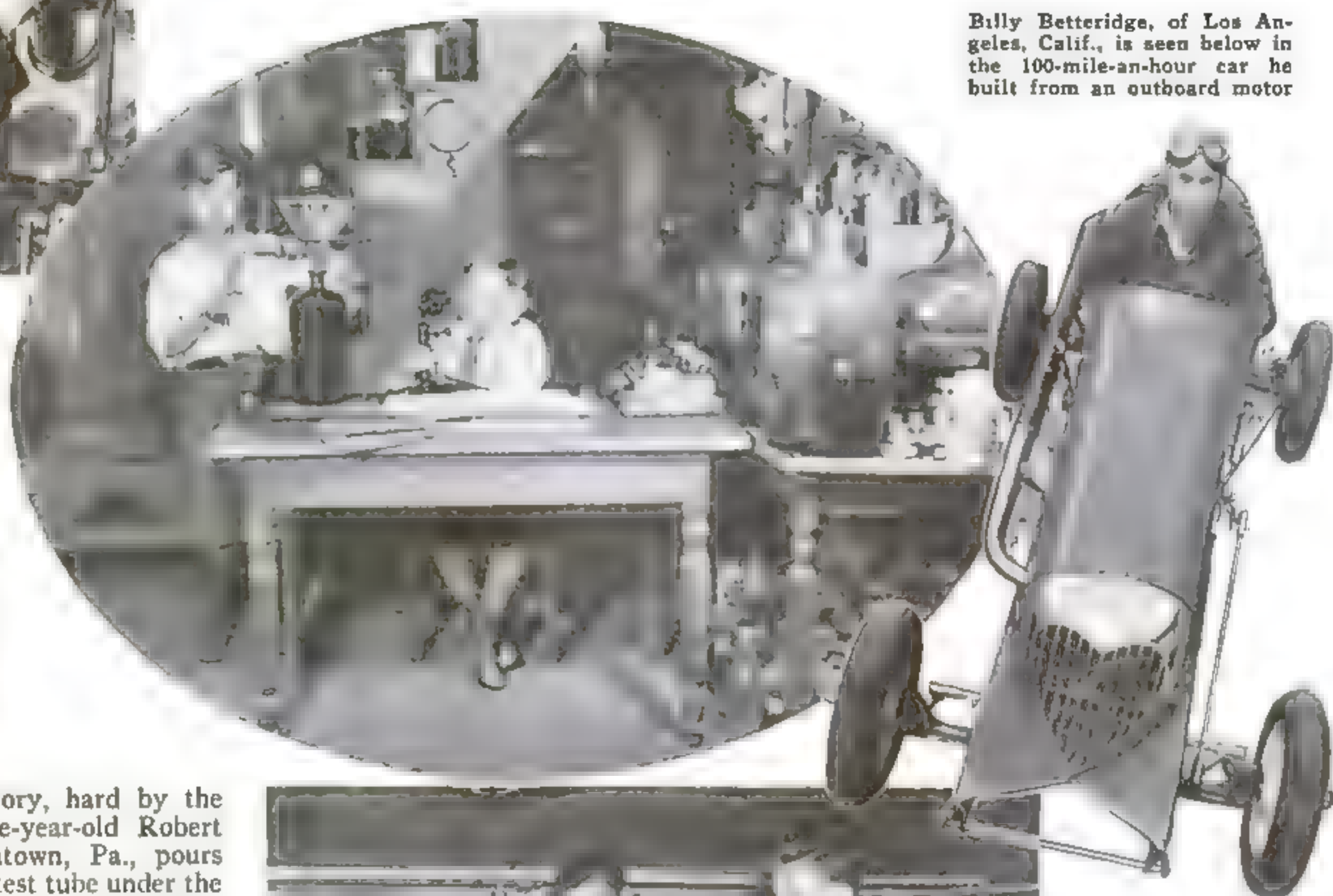
In New York City, the Junior Astronomy Club, sponsored by the American Museum of Natural History, has among

distances, and a cardboard pinhole camera with which he obtained a clear and striking photograph of a solar eclipse. Another member is Bruce Allen, who, in addition to making regular observations of the heavens through his refracting telescope, writes and publishes a valuable little magazine devoted to astronomical events.

As part of their work, the members of this organization recently wrote, edited, and published a "Handbook of the Heavens." It proved to be so well written and informative that a New York publisher became interested, with the result that the volume is now on sale in bookstores all over the country.

It is not news when a farmer boy raises potatoes, but when he applies science and produces choice varieties that command double the regular price, his work deserves mention. Lloyd Blue, of Carbondale,

Billy Betteridge, of Los Angeles, Calif., is seen below in the 100-mile-an-hour car he built from an outboard motor



## PRINT NEWSPAPER

At the left are shown George and Frank Citarias, of Manoa, Pa., running off an issue of their own newspaper, the "Eagle Herald." It carries advertising and has 500 subscribers



its members Robert Miller, a boy who has built several telescopes, an extremely accurate position micrometer for measuring astronomical



Colo., has been doing this for several years. He rents three acres of land from his grandparents, and at harvest time hires fifteen extra hands to dig up the crop. Most of the product goes to local markets. The choicest potatoes, however, are entered in agricultural fairs where cash prize awards help swell his bank account. He is saving his money to pay expenses at an agricultural college.

Another young scientist who is building up a college fund is Cecil Harrington, of Madison, Wis. He breeds butterflies and moths. Each fall, he rounds up all the cocoons and chrysalises he can find and stores them in an empty garage. When they hatch out the following spring, he mounts and sells the males. From the females he collects the eggs, which he places in small match boxes. These he tapes to the branches of low trees so the caterpillars which hatch from them will have natural food close at hand. Each tree is covered with a tent of netting and, from time to time, the young entomologist transfers his crawling charges to new feeding grounds. From the cocoons and chrysalises they produce, he selects the best for storage in the garage. With the funds he is accumulating, he plans to take an advanced college course in entomology.

A thousand miles from Madison, at Audubon, N.J., George Fiddler is also gaining recognition as an expert in natural history. The hobby of this schoolboy is collecting biological specimens. Moths, snakes, spiders, ants, fish, and a score of other forms of life are carefully sorted, classified, labeled, and neatly packed on the shelves of his own natural-history museum. So expert has he become that he is in frequent demand as a lecturer at clubs, meetings, and schools where he illustrates his talks with specimens.

## Young American Specialists, Ranging from Six to Sixteen, Have Achieved Recognition In Varied Fields of Research

By

E. W. MURTFELDT

Who is the youngest inventor ever to be granted a patent by the United States Government? Although the Patent Office in Washington keeps no age record, authorities believe the palm goes to Jordan B. Bierman, of New Rochelle, N.Y. At the ripe old age of seven, he filed his application. Last January, when he had yet to see nine candles on his birthday cake, he was granted patent number 2,068,285.

His invention is an ingenious clothes rack which practically doubles the capacity of a closet. The idea came to him in school, where the larger boys always reached the clothes hooks first and left him wondering where to hang his coat. Instead of complaining, he figured out a

way to provide more hooks in the same space. His idea is being considered by several manufacturers. Now he is hard at work on a combination ice and roller skate.

Last year, at North Brookfield, Mass., a high-school boy, Franklin D. Hayes, put an inventive mind to work and won a \$500 scholarship which is awarded annually to the New England lad who displays the most "Yankee ingenuity." On his father's farm, young Hayes had the job of tending the greenhouse furnace to see that a constant temperature was maintained within the structure. Irrked by the frequent trips he had to make to consult the greenhouse thermometer, he rigged up a delicate thermostatic temperature-control system, producing it from such discarded odds and ends as a strip of sheet iron, a bicycle spoke, the base of an old vacuum cleaner, Christmas-tree light bulbs, and a toy electric-train transformer!

Lack of money, equipment, and materials often is a handicap for the juvenile scientist. But it is not an insurmountable one. Junk yards, automobile morgues, cellar scrap heaps all provide happy hunting grounds for spare parts needed to carry out the job at hand. *(Continued on page 122)*



**BUDDING RESEARCH CHEMIST**  
At sixteen, Joseph Broyles, of Shreveport, La., astonished the Louisiana Academy of Science with a report of pioneer research in blood chemistry

**DEEP-SEA DIVERS.** With a diving helmet of their own invention, John Walsh and Kenneth Plewes, seen at right, went down thirty feet below the surface to make submarine explorations



**SOLO FLYER  
AT AGE  
OF ELEVEN**  
When Jack Chapman, above, made his first airplane flight alone, he was so small that he had to be propped up with cushions to reach the controls. He is shown telling his mother goodbye before taking off from the Suffolk Airport on Long Island



**BOY INVENTOR.** Eight-year-old Jordan Bierman, of New Rochelle, N. Y., showing his mother the patent he received on a new clothes rack



## DUCKLIKE BOAT IS DUCKPROOF



Side paddles turned by foot pedals propel this novel beach boat

BUILT to resemble a giant duck, an odd mechanical boat has just been introduced as a novelty for use at beach resorts. Said to be noncapsizable, the wooden duck is propelled by "side-wheeler" paddles operated by foot pedals from within the boat and steered by making one paddle revolve faster than the other. The photograph at the left shows the curious craft being driven by Olivia De Havilland, prominent film star.



## MOVIE ELEPHANT WEARS DETACHABLE TUSKS

ARTIFICIAL TUSKS devised for Anna May, prize elephant of a Los Angeles, Calif., zoo, enable her to play the role of a bull elephant in moving-picture jungle scenes. When a male pachyderm is required, Anna throws up her trunk, tusks are fitted as shown above, and the thirty-year-old elephant is ready to carry out her male impersonation.

## GLASS BUNSEN BURNER

MADE by an expert craftsman, the Bunsen burner pictured at the right is formed entirely of glass. Base, intake jet, mixing chamber, and outlet tube of the laboratory gas burner were blown separately and then cleverly joined by delicate heating operations.



## ONE-WHEEL TRAILER CLAMPS ON BUMPER

CLAMPED to the rear bumper of an automobile, a one-wheel trailer just introduced is a handy accessory for sportsmen, campers, tourists, and salesmen. In the

photograph above, a salesman has pulled out the sliding floor of the novel trailer and unfolded its metal legs to form a demonstration table for his samples.



## "FOUNTAIN-PEN" KEY OPENS FIFTEEN DIFFERENT LOCKS

BY TWISTING its barrel, an odd "fountain-pen" key can be made to open as many as fifteen different locks of a type recently invented. Operating on a new principle, the plunger key is simply pushed against the lock. This causes a notched strip inside the key to produce a series of measured impacts that release levers to open the lock.

## OLD LOCOMOTIVE GETS MODERN DRESS

SHEATHED in shining steel, a steam locomotive built in 1900 has been transformed into a modern streamliner to haul a crack train

over the tracks of a western railroad. Still in first-class operating condition, the modernized ten-wheeler runs on a branch line that connects with the Hiawatha, a streamliner operating between Chicago, Ill., and Minneapolis, Minn.



The locomotive before and after modernizing

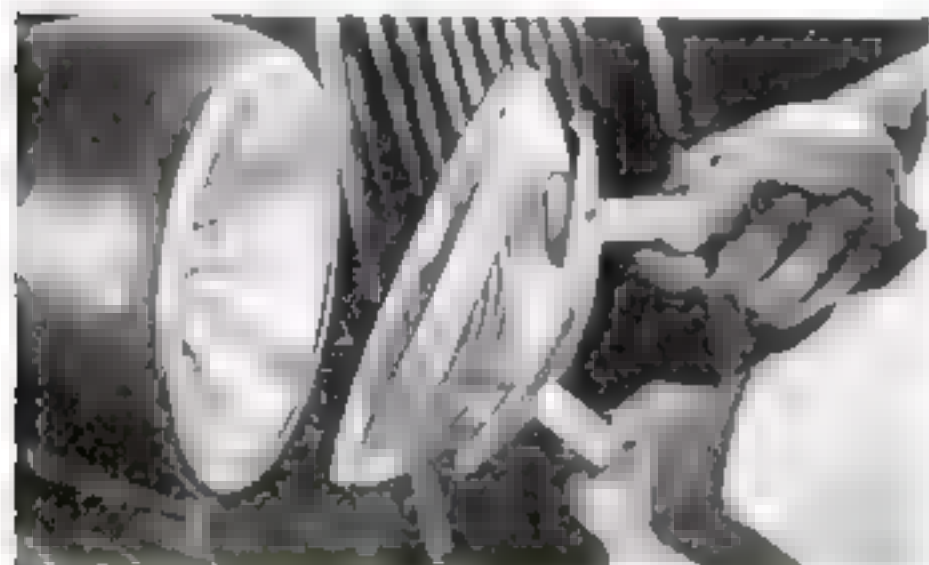




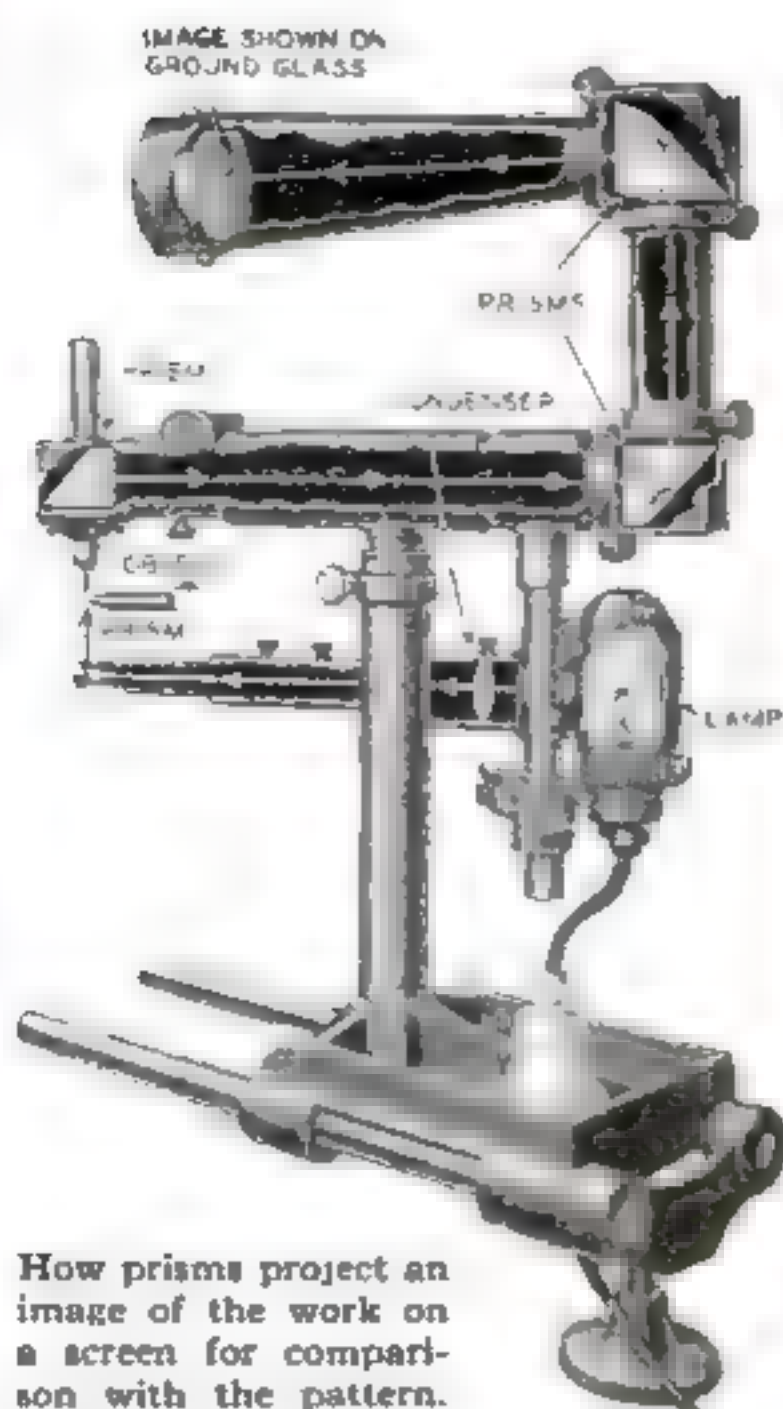


### ODD FACE MASK IS USED IN BEAUTY TREATMENT

LOUNGING in a bath of milky liquid kept bubbling with compressed air forced into it, a patron of one of New York City's large beauty shops wears the odd face mask shown in the photograph above. While it does not enhance the appearance during use, the specially designed mask is said to remove wrinkles, tone the skin, and restore youthful contours to the face of the wearer.



## PERISCOPE ON LATHE MAGNIFIES WORK



How prisms project an image of the work on a screen for comparison with the pattern. Right, lathe in use



**T**INY parts can be accurately machined on a new profile lathe that is equipped with a novel periscope projecting device. Clamped over the lathe, the apparatus projects a magnified image of the work through a series of prisms onto a ground-glass screen. On the latter is drawn a pro-

file of the work as it should appear when it is finished. By machining the work so that its image corresponds exactly with the pattern drawn on the screen, the material can be cut to the precise dimensions and shape of the pattern. The lathe is expected to be specially useful in model making.

### VACUUM TOOL REMOVES HEADLIGHT LENSES

FRAMELESS headlight lenses, now in use on many late-model automobiles, are easily and safely removed with a handy new gripping tool. Rubber vacuum cups attached to two handles are pressed against the glass, providing adequate leverage for lifting out the lens without fear of breaking.

## FOLDING DRESSING ROOM FITS ON CAR

ATTACHED to the side of a car, an ingenious automobile tent provides a convenient dressing room for use at beach or swimming resorts, or with a car that is

equipped with a bed for camping. Clamped to two open doors, the auxiliary "room" has canvas walls supported on a collapsible frame. A flap extends over the top of the car and hangs down far enough on the other side to curtain the windows. The outfit is said to require only a few minutes for erecting or taking down, and rolls into a compact bundle only thirty-six inches long and eight inches in diameter.

Below, the tent set up for use by bathers at a beach



Framework attached to a car equipped with a bed

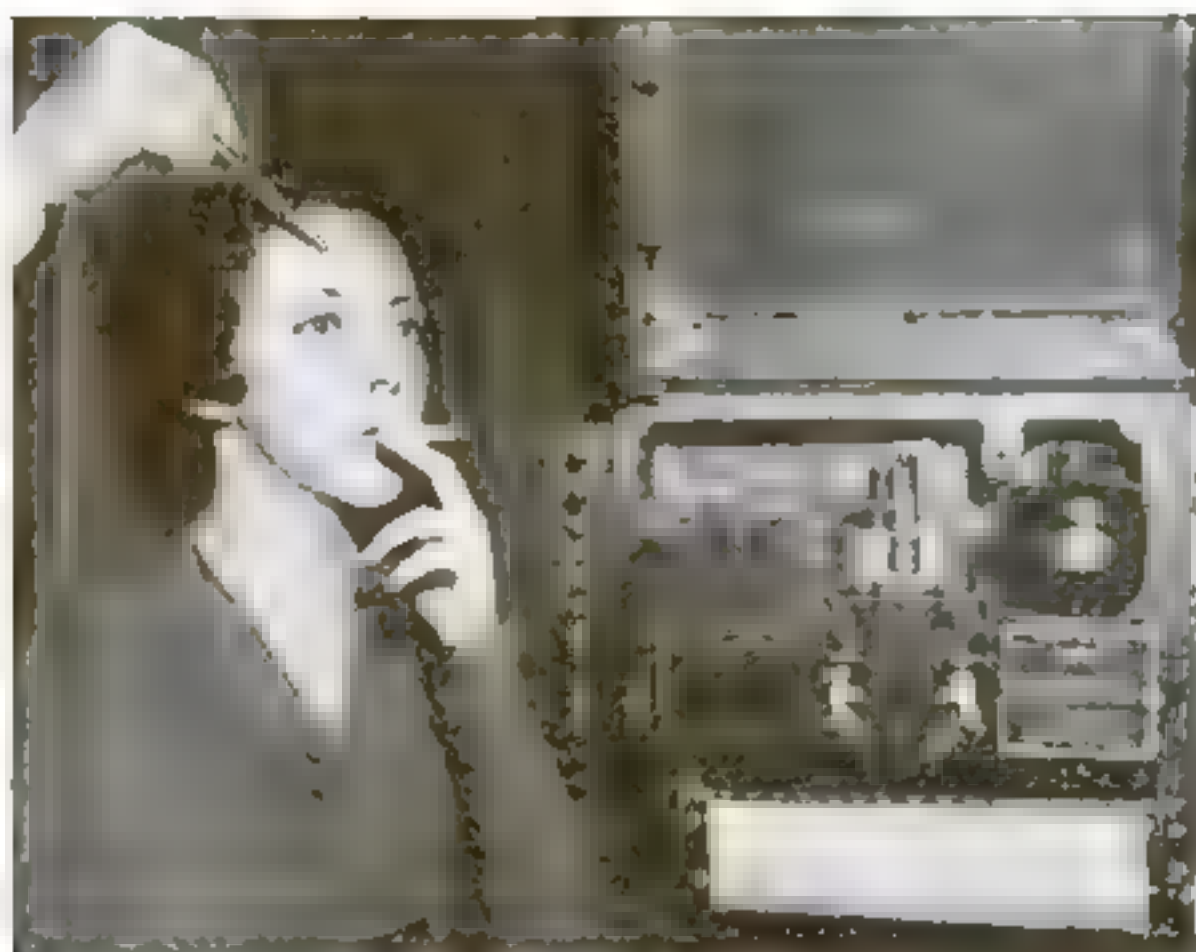


### CALIFORNIA HIGHWAY IS PAVED WITH GOLD

GOLD-BEARING ore worth seven dollars a ton forms the base of a highway connecting Julian and Ramona, towns in a mining region of southern California. Material for the eleven-mile road was taken from a nearby quarry, which is now being worked for gold since the discovery of its unsuspected value. The photograph shows the quarry owners searching the dump for gold-bearing quartz.



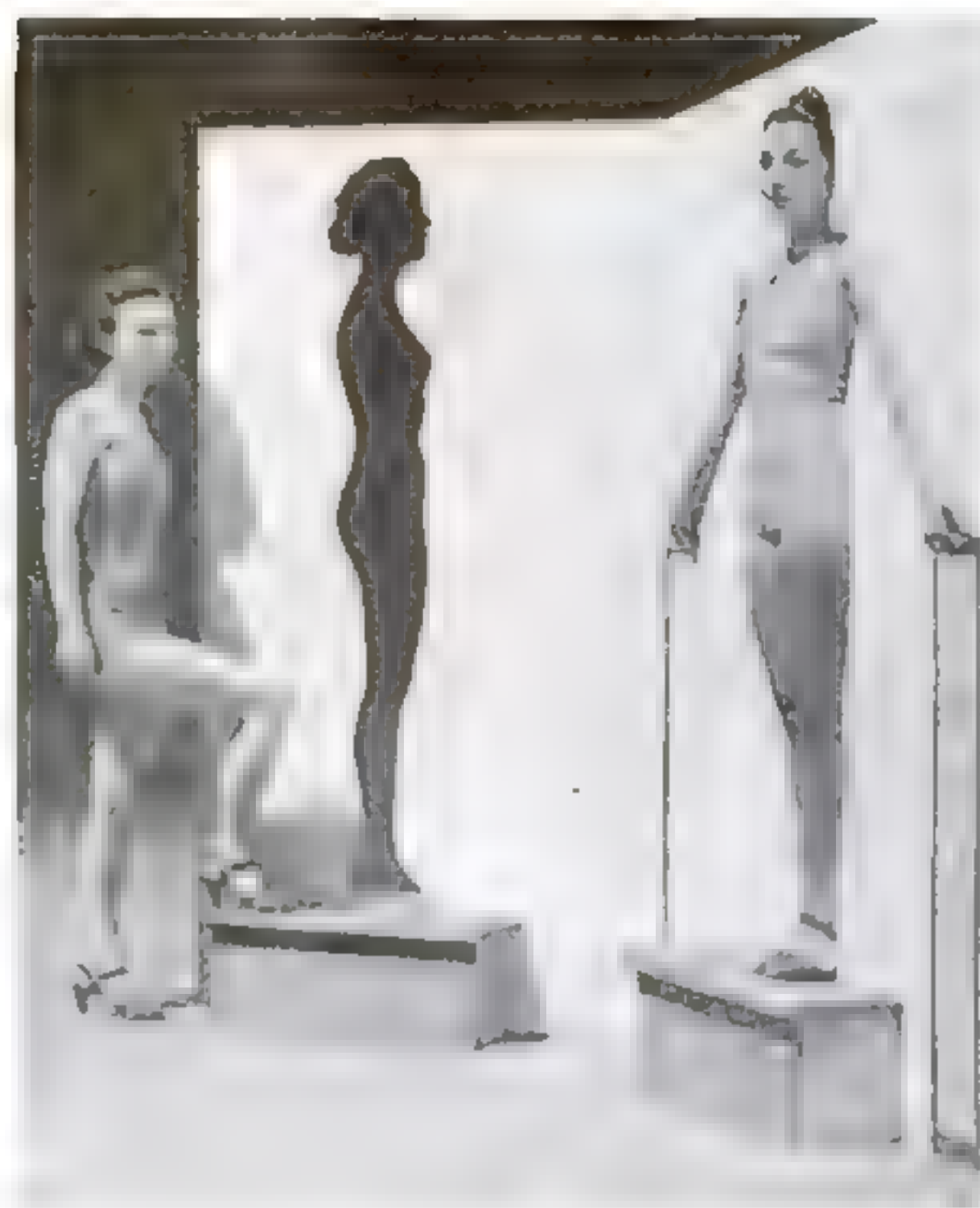
## TAKES TEMPERATURE OF SKIN



Left, subject taking temperature of forehead in smoking. Above, hand in clay mold to hold thermometer at finger tips

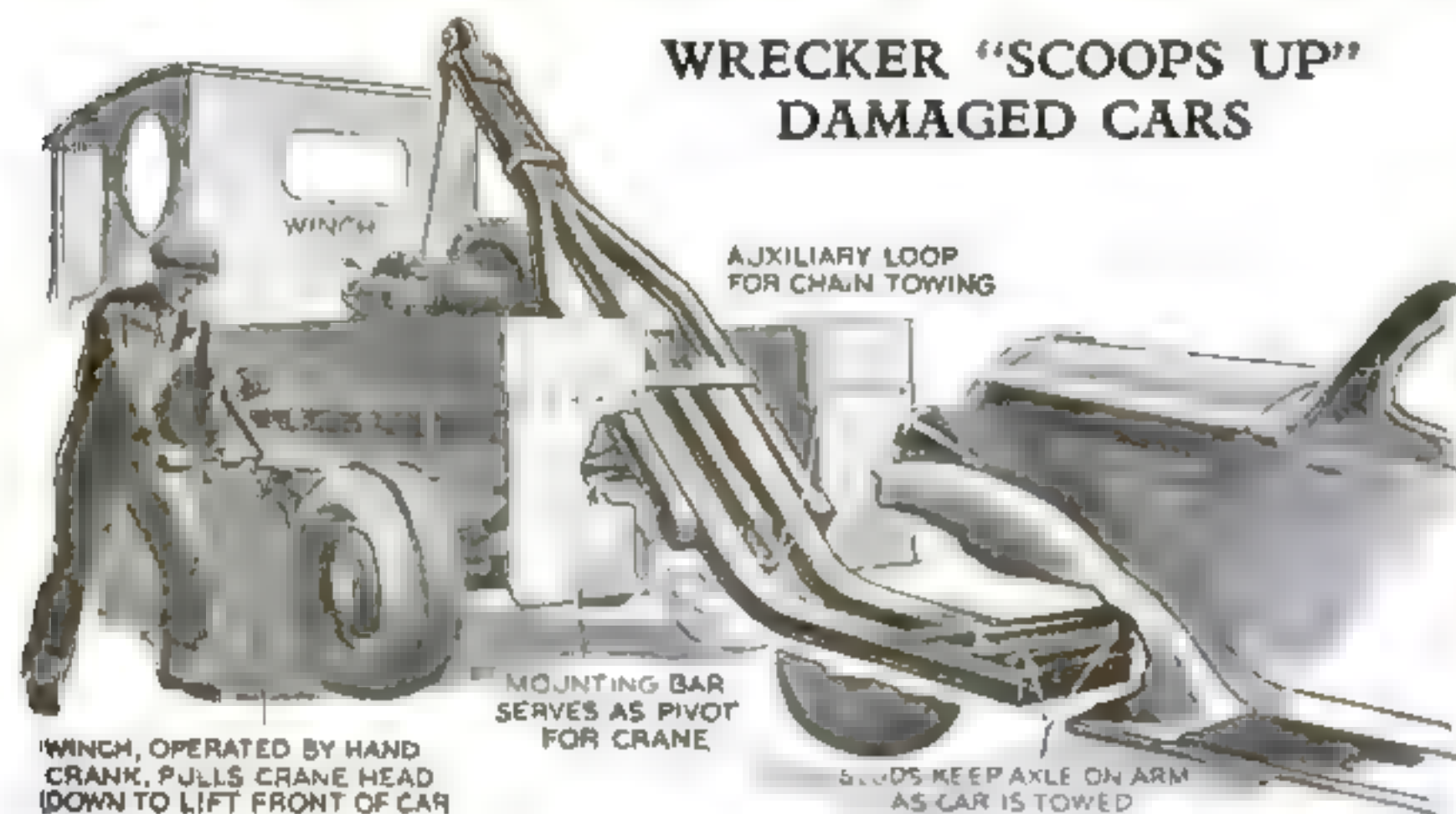
CHANGES of temperature in the skin at various points on the body are measured with a novel instrument devised by research workers at the Post-Graduate Hospital in New York City. The surface to be tested is touched with a thermocouple, or union of dissimilar metals, and an electric recording device registers the temper-

ature in a black line drawn on a moving tape. The device was used in experiments conducted recently to test the effect of smoking on the temperature of the skin, especially at the forehead, finger tips, and other extremities of the body.



## ODD CUT-OUTS JUDGE BEAUTIES

JUDGES of beauty contests may find their task lightened by a scheme recently tried out at a Miami, Fla., country club. From composite measurements of past contest winners, a jury of artists designed cut-outs to test the qualifications of new entrants. The photograph shows a contestant in the full-face silhouette.



## WRECKER "SCOOPS UP" DAMAGED CARS

A WRECKING crane that "shovels up" a damaged car has been designed by an Illinois inventor. To raise the front end of a car for towing, a shovel-shaped hoisting frame is simply run under the axle and elevated with a hand winch. The car may

then be transported to the repair shop without ropes or chains, eliminating the danger of marring the finish or straining the steering members.



## MEMORANDUM PAD IS WORN ON THE WRIST

FOR busy executives and engineers, a Soviet inventor has produced the "wrist notebook" illustrated at left. A self-opening cover exposes a section of a continuous ribbon of paper to serve as a writing surface. When this section is used up, a new one is reeled into place, just like film in a camera.

## LIGHT BEAM FOCUSES CAMERA AT NIGHT



When an image is focused on the object, as at left, the camera also is in focus

Below, camera fitted with a special lamp and focusing mirror



BY THROWING an illuminated letter "C" upon the subject, a new electric range finder enables a photographer to focus his camera in pitch darkness. A focusing mirror on the back of the camera, optically matched with the lens, projects an image of the filament of a special miniature lamp attached to the lens front. When the glowing "C" has been brought into sharp definition by turning the focusing knob, the camera is correctly adjusted.



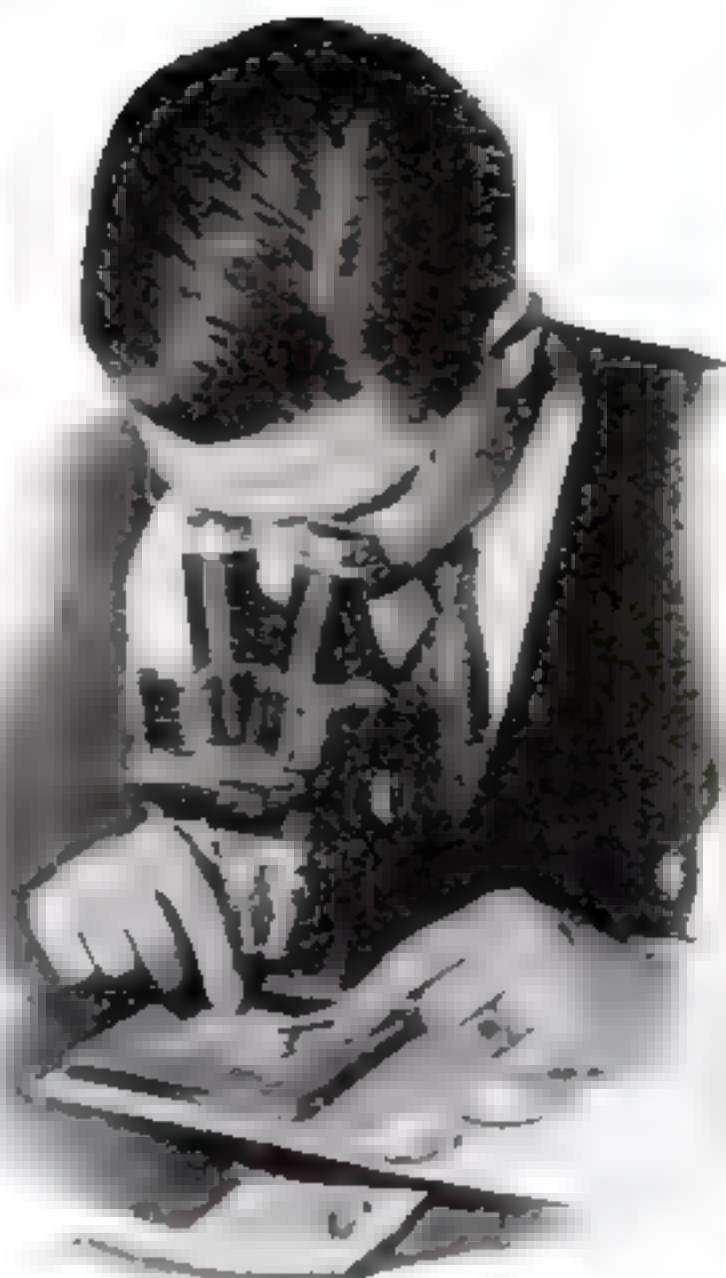
## SAFETY SPOT SHOWS UP FAULTY FLASH BULBS

BUILT into a photographic flash bulb of new design, the telltale blue spot of chemicals indicated in the picture above serves as a warning signal. If enough air has leaked into the bulb to cause a misfire, the spot turns pink, safeguarding the photographer against using a "dud." Metal wire is burned in the bulb, instead of the conventional metallic foil.





Bottled bird stomachs being received at the U. S. Biological Survey Laboratory and, at right, under examination



## "PAINTS" PICTURES WITH POWDER PUFF

Using a powder puff and ordinary face powder, Paul Frankel, Los Angeles, Calif., artist, creates in his paintings curious pastel color effects that are said to be impossible to obtain with conventional materials and technical methods.



Painter demonstrating powder-puff technique

## BIRD STOMACHS SHOW EATING HABITS

WITH a file of over 125,000 bird stomachs, experts at the U. S. Biological Survey laboratories in Washington, D. C., are conducting an extensive study of the eating habits of thousands of varieties of birds. Collected from all corners of the world, the stomachs are classified, labeled, and filed on rows of shelving. After skilled

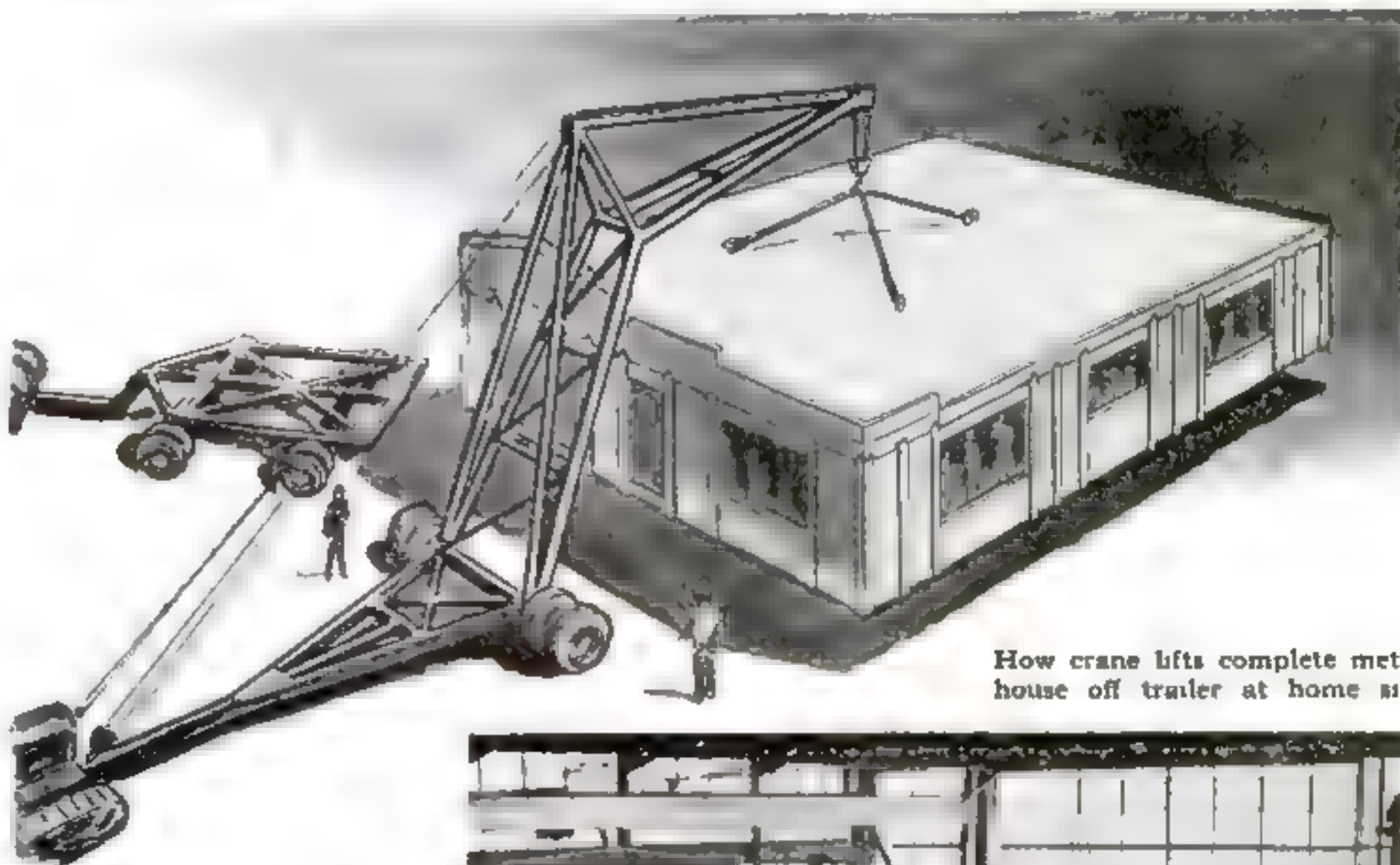
technicians open the digestive organs, the contents are washed to separate grit from food matter. The latter is then subjected to painstaking microscopic and chemical analysis. Complete records are made of the stomach contents, which are then placed in sterilized containers and filed away for future reference in studies of bird diet.



## WOODEN HORSE COLLAR ENDS BLANKET-EATING

TO PREVENT a race horse from twisting his head around to chew at his blanket, his owners devised the novel wooden collar pictured above. Longitudinal slats attached to ropes around the trotter's neck keep him from turning his head around for a bite of blanket, but allow sidewise and up-and-down movement.

## TRAILER DELIVERS READY-MADE HOMES



How crane lifts complete metal house off trailer at home site

## PERISCOPE HATS FOR PARADES

MIRRORS mounted on a new "periscope" top hat allow the wearer to see over the heads of crowds at parades and sporting events. Images are reflected from a mirror on the hat crown through a hole in the brim to a second mirror and thence to the eyes, as shown at left.



FIVE-ROOM houses, complete in every detail, are being built within the walls of a Peoria, Ill., factory, hauled out by tractors, transported on sixteen-wheel trailers, and set down on home sites by a tractor crane. With the exception of plumbing fixtures and insulation, all parts of the houses are made of steel.

A built-in garage also houses a heating and air-conditioning system. The manufacturers claim that the dwellings are fireproof, dustproof, insectproof, and even earthquakeproof, since they can not be damaged by shifting or settling of the ground



Finished house being jacked up in factory for delivery by trailer

on which they stand. When the first of the steel homes was hauled from the factory, interior decorations were completed and a fire was burning in the furnace, to have the dwelling warm on delivery and ready for immediate occupancy.





Camera crew filming close-ups on a ninety-ton revolving set representing the base of a huge pillar for a recent musical production

## BEHIND THE SCENES WITH THE MEN WHO BUILD GIANT MOVIE SETS

**W**ITHIN the walls of Hollywood's 100-odd sound stages, you will find miracles of mechanics and construction being wrought continually by a legion of workers whose products live a few days, then perish, the only records being fleeting scenes imprinted on film.

Centuries of time and thousands of miles of space are compressed within these noiseproof buildings. Actors impersonate angels on one stage, while others relive ancient history in an adjoining building. San Francisco's Barbary Coast burns today, on the same spot where New York's Grand Central Terminal will rise tomorrow. Within three months, on one stage, the battle of the Argonne Forest was fought, the walls of Jericho fell, and Jerusalem resisted the onslaught of attacking hordes.

Pastoral scenes, country orchards, beaches, and mountains have become common sights on Hollywood's sound stages. As for large and intricate sets involving mechanical ingenuity, many which stagger the imagination even of blasé Hollywood are blossoming, only to die with the setting sun.

Tourists visiting California a few years ago could reasonably expect to see two or three location companies shooting melodrama or comedy on Hollywood Boulevard, in down-town Los Angeles, or on some near-by highway. Now, very likely, you can spend an entire season in and near the movie capital and never witness a scene being filmed.

Here's a case in point, which explains why all save pictures really requiring broad open spaces are filmed indoors, and how



A scale model of an elaborate setting. Besides serving as a guide for the set builders, such models aid in planning the action and lighting effects



# Miracles of mechanical ingenuity are performed by expert craftsmen on the sound stages of Hollywood

By ANDREW R. BOONE

a novel and complicated set was arranged. Not long ago, a studio decided to film a picture requiring, as they thought, a trip to Hawaii. One scene alone called for an ocean, men fishing, a swimming pool, mountains with palm trees in the background; and the sense of distance must be correctly portrayed.

Hurried estimates showed that the trip would cost \$100,000 in travel expense and salaries, for scenes lasting no longer than eight minutes on the screen. Art director, technical expert, cameraman, director, and supervisor held a conference. A blueprint drawing resulted, followed by a painting in colors, and a model. Less than three weeks later, eighty-three actors crowded around a little indoor pool, and anglers fished from a near-by dock. In one corner stood a painted replica of a mountain, while in the distance there flashed on a large screen a motion picture of waves lapping at the beach. These, in turn, were rephotographed by the camera which recorded the action in the foreground. All this was completed within four weeks, at less than one fourth the estimated cost of a "location" trip.

The ingenuity of these wizards with wood, steel, cloth, and paint staggers the imagination. Barren, empty as a proverbial barn today, a sound stage may be transformed, as at the wave of a wand, into a section of a city, a jungle, or even the movie conception of heaven.

One production manager opened his shooting script, not long ago, and read

The picture at the right shows how seashore scenes can be filmed on the sound stages. A dark-blue curtain in the background leaves blank space on the film, on which an actual view of the ocean is double-printed later for a seascape effect



A director studying the various parts of a set through a portable finder to locate the best angles for the camera

with amazement this description of a set, as visualized by the scenarist: "Picnic grounds in heaven, including green fields, running brooks, moss-hung trees, and fleecy clouds sufficiently substantial to support thirty people."

Only for a moment was he fazed. Then he called into conference the art director and a designer and proceeded to lay plans for the setting. Four days later, carpenters poured onto the huge sound stage. Thirty-five tons of earth were dumped onto the floor. Nearly a half acre of lawn was transferred from another part of the lot to the stage. Synthetic trees made of papier-mâché and silk sprang up almost overnight, and on them artificial moss of dyed excelsior was draped. Electrically driven pumps caused real streams to flow through wooden troughs, camouflaged to resemble country brooks. Real, live catfish swam in the streams.

Two weeks after the production manager



## BUILDING THE SET

Carpenters at work on the set represented by the model shown on the opposite page, for "Top of the Town"





This mammoth typewriter was constructed for just one "shot" in a recent picture, in which it provides a novelty setting for a dance routine

had read the startling order, flesh-and-blood "angels" walked onto the stage, and by noon were riding clouds of wood and muslin suspended by invisible wires from rollers moving on tracks high in the rafters. Crepe hair, ordinarily used to make artificial chin whiskers, added the desired fleecy effect to the clouds.

Magicians of the movies, who produce these novel effects within the confines of stage walls, think no more of erecting huge sets in a few days than a building contractor does of constructing a home in several months. Not long ago, a director called for a Ferris wheel to be built on a sound stage whose roof rose forty feet above the floor. As if that were not enough, he required that while the wheel was revolving vertically, the entire set must also rotate horizontally.

Again, the production department went into a huddle. Soon the metal shop built an all-steel turntable forty feet in diameter, installed it on the stage, and connected it by an endless chain to an electric motor equipped with a ten-speed control. The Ferris wheel rode in a cradle, with the endless chain circling the wheel itself, while a system of worm gears turned the supporting platform. Thus was obtained a vertical-horizontal effect of the huge wheel turning as cameras ground on the scene.

Sometimes carpenters, tinsmiths, and plumbers rush an intricate set to completion, only to have the director or cameraman find that it cannot be photographed. Working under rush orders, carpenters and plumbers recently laid seven miles of quarter-inch iron pipe on the floor of one of the big stages at the Twentieth Century-Fox studio. Over these pipes they packed thirty-eight tons of wet sand. Ammonia was turned into the pipes from a near-by refrigerating system, freezing the sand as hard as rock. Water then was poured over the sand to a depth of three and a half inches, and this in turn frozen.

Next day, eighty-four skaters sped across the ice in rehearsal, but before the director could call for "action," the cameraman pronounced the set unsatisfactory. The ice was black when viewed through the camera!

That afternoon, the problem of black ice was solved when an ingenious property

man, who once had milked cows on an Iowa farm, suggested that a thin coating of skimmed milk be poured on the surface and frozen. His idea was tried, and two hours later Sonja Henie, Olympic figure-skating star, was gliding over the glistening milk and the cameras were turning on a brilliant scene in "One in a Million."

At the new Universal Studio, which nestles in the foothills on the edge of the San Fernando Valley, I saw the other day exactly how a gigantic set evolves from a nebulous idea. The ghostly form of the incomplete set nearly filled Stage 12, almost a city block wide and over a block long.

"What does all this represent?" I asked John Harkrider, the art director who designed many of the sets appearing in the late Florenz Ziegfeld's famed "Follies," and who now produces movie sets in a fraction of the time formerly required for stage settings.

"Nothing, yet," he explained, "but in a few days it will portray the 'Coral Cove' in Rockefeller Center, New York City, as it might look if it were built twenty-five years from now."

"But how was it conceived and created?"

"At the outset, the scenario called for such a room," he explained. "With the designers, I discussed the type of set to be produced. Artists painted six pictures of what we thought the set should look like. Eight designers devised details from the selected painting. Twelve draftsmen converted the details into working plans. In the model shop, a dozen workers turned the plans into models, duplicating exactly the projected set and even using the same type of materials. On these the director plotted the action, the head electrician planned his lighting, the cameraman studied camera angles. Thus we plan every step of the action, and eliminate delay and guesswork when the cast reports on the stage for duty."

With the models available on the stage for study, 175 workmen completed the set in three weeks at a cost of \$20,000, building it solidly from wood and fabric, for it had to be safe for technical crews and actors despite the fact that it was to be discarded within a month.

No movie producer is content until he "out-spectacles" the offering of a rival, and within a few weeks he probably will see his own efforts dwarfed by some novel set created on another Hollywood sound stage. Even the creative genius of Ziegfeld, known for years as a producer of dazzling stage settings in New York, recently was eclipsed on Metro-Goldwyn-Mayer's largest stage, when carpenters and metal workers rushed to completion a giant pillar base weighing ninety tons, on which 192 men and women actors performed as heavy machinery revolved the "stairway stage," as it was called.

The complicated setting rested on a revolving stage built of structural steel. For it, 115 separate construction drawings and architectural layouts were completed in eight days. The stage was constructed with a steel ring carrying a huge curtain which, pulled by forty-eight lines running to twenty-four electric motors, geared through a reduction transmission, tripped and fell away from the set as it turned, to reveal various groups of people.

Even as in the theater, a backing must be provided for every such setting. Beyond the pillar rose a circular background tall as a seven-story building and 260 feet long, made of wall board and dotted with 6,000 holes. This *(Continued on page 115)*

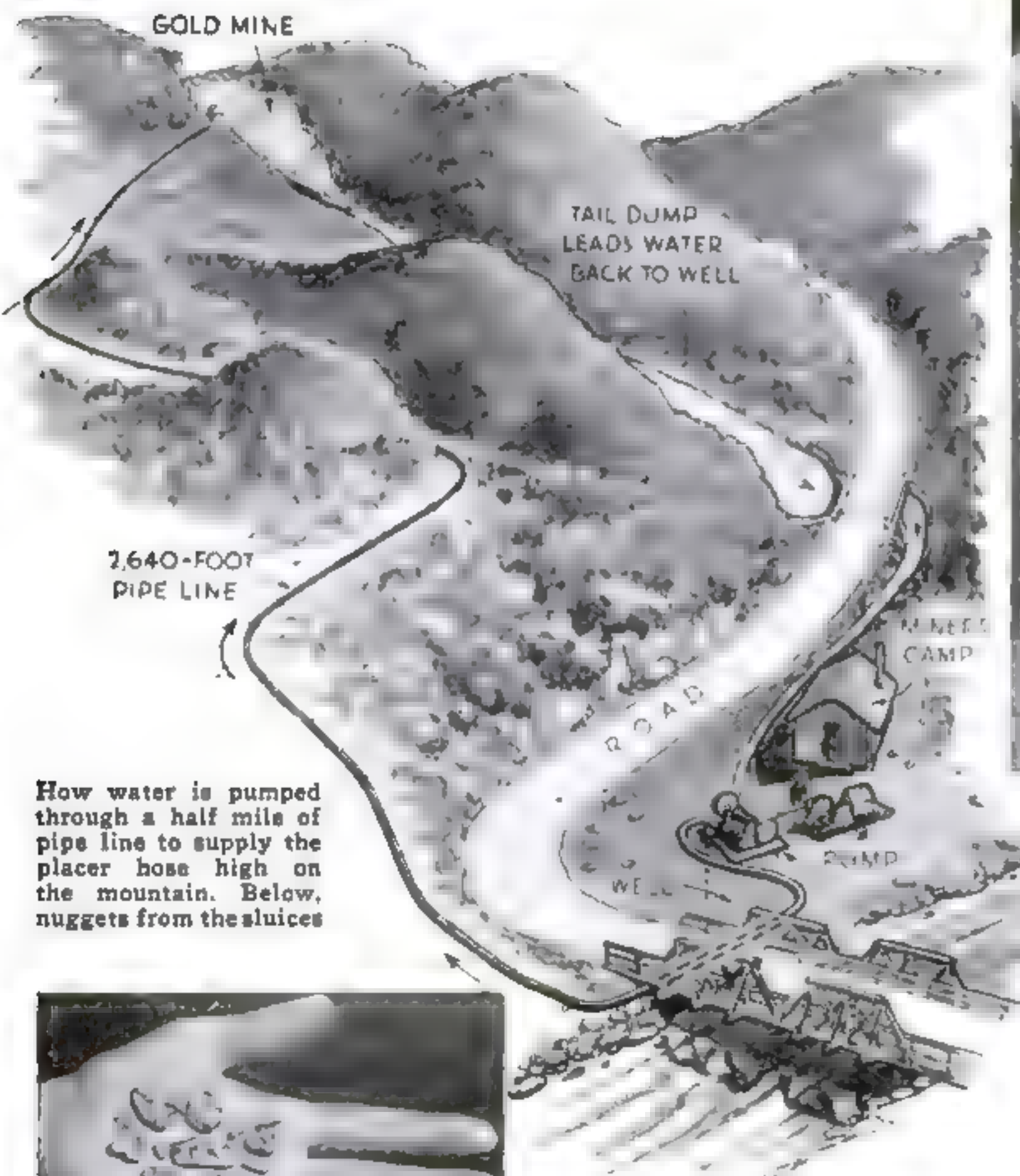


A scene in the model shop, where expert workers build accurate miniatures of projected sets from plans prepared by directors and technicians



# Two-Man Gold Mine

IS WORLD'S STRANGEST  
PLACER OPERATION



How water is pumped through a half mile of pipe line to supply the placer hose high on the mountain. Below, nuggets from the sluices



**I**F A Los Angeles motor-bus mechanic hadn't lost his job, the world's strangest gold mine might never have come into existence. The story of this mine, the "Depression Buster," near Glendora, Calif., is an epic of the present-day West.

With his slender savings, the mechanic, Ross Hemming, bought a gold pan, a camping outfit, a grubstake and a few simple mining tools. For more than a year, he earned a thin and precarious living working the low-grade, gold-bearing sands of various California streams. Nights, he pored over books on geology, mineralogy, and the methods of mining engineers. Then, with a partner, M. Judson, he struck out through the mountains for serious prospecting.

High on a canyon wall, near Glendora, they found a large vein of conglomerate

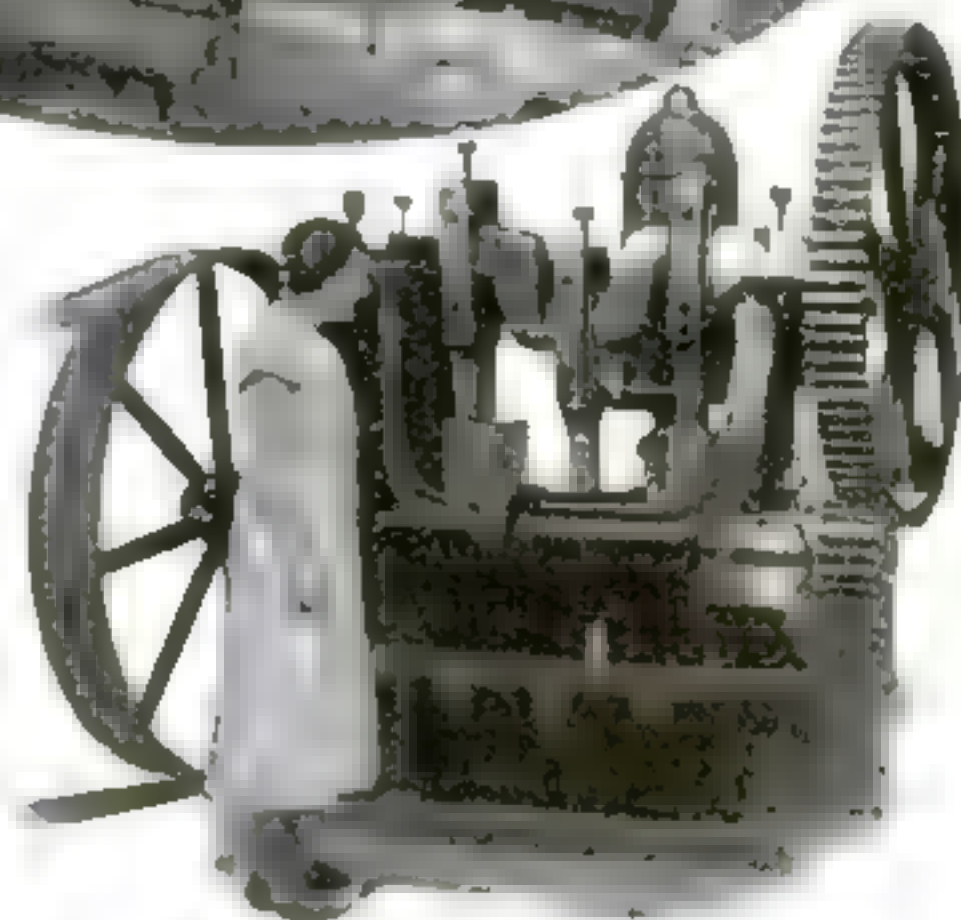
rock deposited by the waters of some prehistoric stream. Samples assayed at from sixteen to fifty-seven dollars a ton. As soon as their claim was filed, they decided, in defiance of orthodox mining methods, to extract the ore by placer operations.

The mine was half a mile from the nearest river and almost as high above its water level. To obtain money for the needed pipes and machines, they began operations with a homemade gold dredge assembled from old automobile parts and irrigation pumping machinery. With rollers, jacks, and crowbars, the two men moved this heavy machine, inch by inch, for nine miles along the bed of the stream until it was opposite their claim. Then, in pack sacks, they carried the gold-bearing material on their backs down the canyon side to work it mechanically through the gold dredge and sluice boxes.

The next step was a metal chute down which they could slide the rock. By October, 1935, they had saved up enough



The owners of the Depression Buster Mine at work washing the gold-bearing rock from the hill with the hose

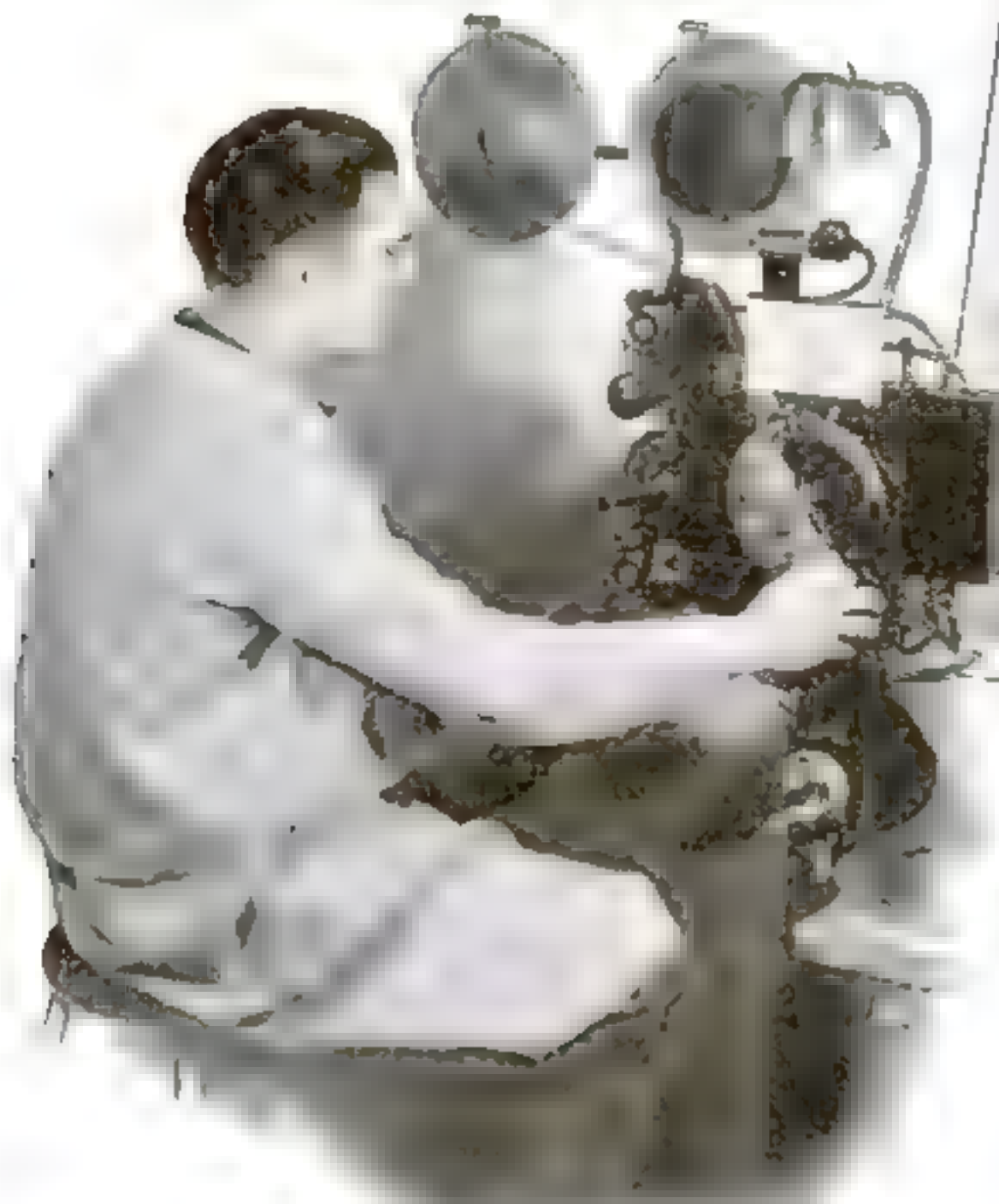


This pump, driven by the gasoline engine seen in the oval, sends water through the pipe line

money to commence operating the only placer mine of its kind on earth. They bought 2,640 feet of second-hand, four-inch pipe from an oil field that had gone dry. In addition, (*Continued on page 123*)



A worker in the U.S. Army Signal Corps photographic laboratory at Washington, D. C., printing a master positive film from negatives of motion pictures of the World War



A priceless photograph of President Lincoln visiting Gen. George B. McClellan during the Civil War

# Uncle Sam's Picture Album



## FORTRESS FOR WAR PICTURES

In this fireproof building, made like a vault within a vault, the Army is guarding its photographic war trophies

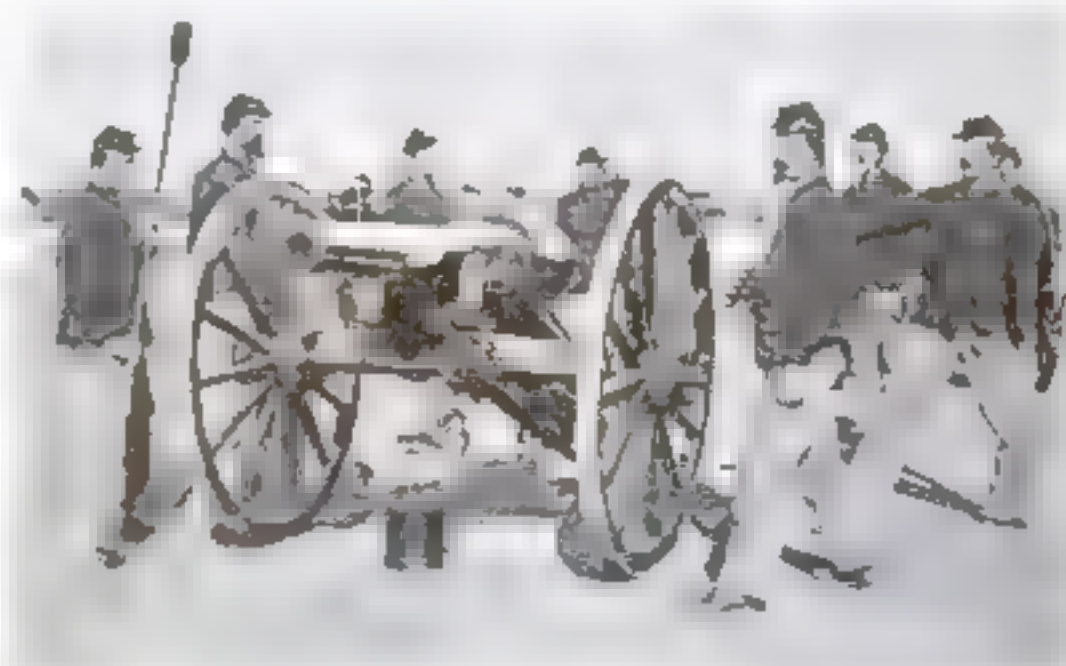
**I**N A LABORATORY at Washington, D. C., photographic experts of the U. S. Army Signal Corps keep constant watch over the 150,000 negatives and hundreds of miles of motion-picture film that record our military history from the Civil War to the present day. Thanks to their vigilance, soldiers and civilians of the future will be able to see actual photographs of Union infantry in the trenches before Petersburg, Va., of "Teddy" Roosevelt and his Rough Riders at San Juan Hill, and of doughboys cleaning out machine-gun nests in the Argonne—pictorial history that makes the textbooks come to life.

A fireproof building near the laboratory houses this priceless collection of war photographs. Specially guarded are the 6,000 negatives made by Matthew B. Brady, the pioneer war photographer who followed the Union armies on their campaigns, using a horse and buggy to transport his clumsy cameras and a makeshift darkroom in which the plates were processed on the spot. Made on glass by the wet-plate process employing collodion instead of gelatin, those of Brady's negatives that have escaped breaking are in better condition today than much of the motion-picture footage exposed on nitrate film by Army cameramen during the World War, and hastily processed.

Signal Corps men have just completed the huge task of editing and rephotographing the hundreds of thousands of feet of World War movies. Master positives have been made of 750,000 feet of selected material, which has been classified on a military basis and filed away in steel storage vaults as a safeguard against the original negatives going bad.

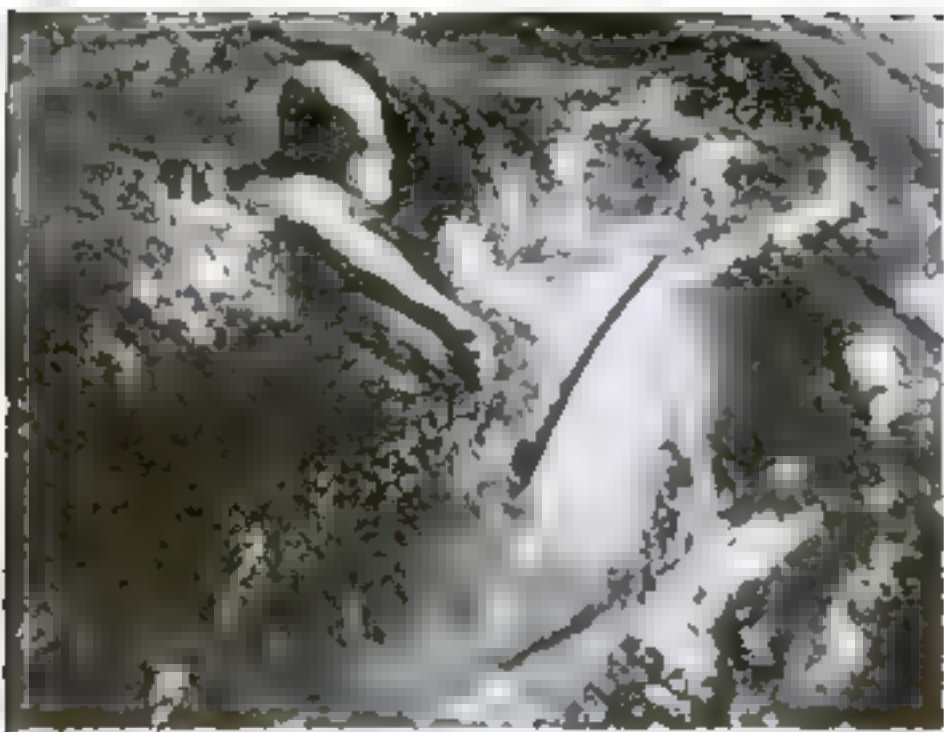


Mobile darkroom used by Matthew B. Brady, Civil War photographer, while he traveled with the armies. At the right is one of his famous pictures, showing a gun squad going through a drill



...HOW THE ARMY PRESERVES ITS WAR PHOTOGRAPHS





Three scenes in a life-and-death struggle between a lone swimmer and a killer of the deep

## CAMERA CATCHES BATTLE WITH MAN-EATING SHARK

BATTLING a man-eating shark with a slender knife as his only weapon, Wallace Caswell, Jr., young Florida dare-devil, is shown in the photographs above in three stages of the desperate struggle. Caswell first took up his perilous hobby after the sea monster had repeatedly ripped his fishing nets to shreds. The intrepid fisherman has been injured only twice.

## MOVIE VIEW FINDER SHOWS FILM USED



A graduated strip alongside the finder image indicates the footage devoted to each scene

A NEW home movie camera has a view finder which indicates the amount of film used. As the operator sights his picture, he can determine how much film he is devoting to a particular scene, and also the exact footage still unexposed, by referring to a graduated strip which moves along the left side of the finder image. A conventional footage indicator is supplied for ready reference when the camera is not in use.



## GLASS CAR REVEALS MECHANICAL DETAILS

Hood, doors, and top of a German automobile recently exhibited at a motor show in Berlin were made of glass to allow prospective buyers to examine details of the body construction. Through the glass walls of the body, customers were shown

the action of the locks and handles and the placing of the inner bracings, while the engine was clearly visible through the transparent hood. Temporary lights illuminated the car interior to permit the best possible view from the outside.

## WOOL MITTENS HELP PIANISTS



Henry Scott, pianist, using mittens in practice to improve technical facility. Right, stall for third finger

PIANO technique is said to be improved by wearing specially designed woolen mittens during practice. The odd hand coverings were devised by Henry Scott, recently acclaimed the world's fastest pianist when he played 268 notes accurately within six seconds. Handicapped by the woolen coverings, the piano student is said to develop an improved technique. The weak third finger is strengthened with an extra covering, as shown. The mittens can also be used by typists to develop accuracy.



## BUILD BARRIERS FOR CROWDS

TO HOLD BACK surging throngs, novel "crush barriers" are now being erected by police officials in London. The wooden barricades, shown above, were devised in anticipation of the huge crowds expected during the coming coronation ceremonies.





## FISHING KIT HOLDS MOTOR FOR BOAT

LIGHT in weight and easy to handle, a new fishing kit includes space for a lightweight outboard motor. Completely waterproof, the kit's metal case also provides sufficient room for stowing four casting rods, a one-gallon fuel can, four reels, and a tackle box up to seventeen inches long.



A lightweight outboard motor is included in the equipment carried in this fishing outfit



## TRAFFIC-CONTROL BOOTH HAS GLASS WINDSHIELD

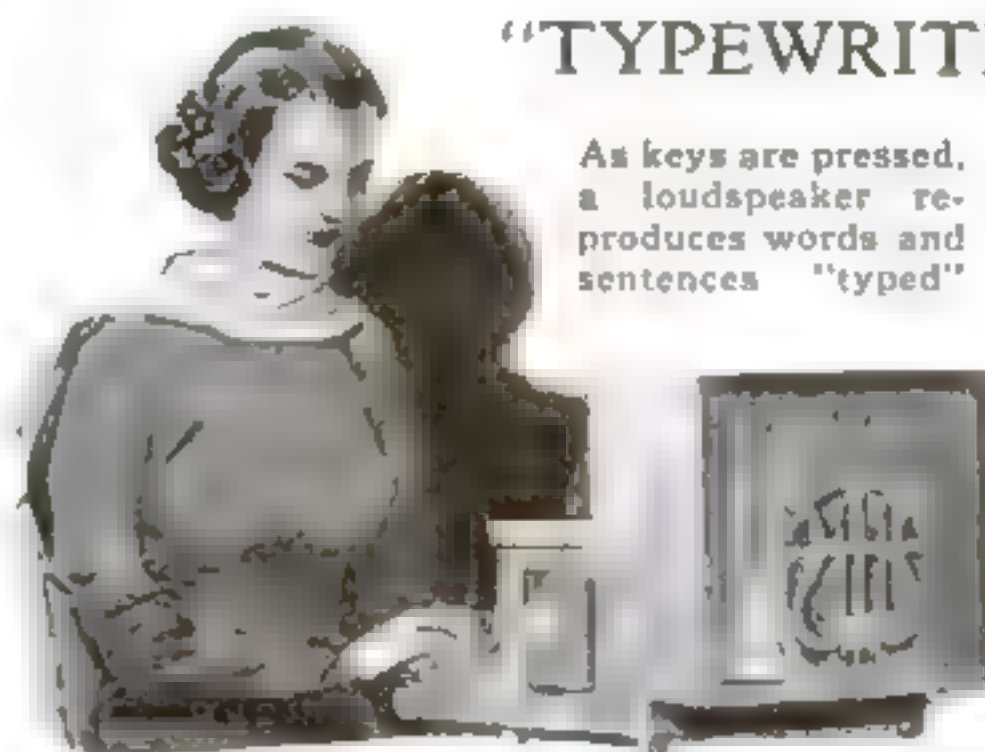
SLIDING along a circular groove, a curved section of glass acts as a windshield in the traffic-control booth shown in the photograph above. The glass shield incloses only a part of the booth, but can be turned to face in any direction, thus affording the policeman protection from strong winds or driving rain. Signal lights mounted on top of the unit are operated by control levers inside.



## TEST BICYCLES IN 19,000-MILE TRIP

TO TEST the durability of bicycles made in a new government factory, a group of Soviet cyclists recently made a 19,000-mile run around the borders of Russia and Siberia. Starting at Kiev, the cycle cavalcade went along the shores of the

Caspian Sea, through central Asia to the Pacific Ocean, and thence back on a northern route to Moscow. Part of the 357-day journey was made over railways, the machines being fitted with flanged "outrigger" wheels, as shown in the photograph above.



## "TYPEWRITER" TALKS FOR MUTES

As keys are pressed, a loudspeaker reproduces words and sentences "typed"

MUTE persons are able to "speak" with the aid of an ingenious "talking typewriter" just invented. The keys of the machine represent elementary speech sounds and, when pressed in rapid succession, actuate a sound film that reproduces the typed syllables through a loudspeaker. A space key allows the user to separate words and sentences. After careful practice, it is said, a speechless operator can carry on a normal, intelligible conversation with the artificial voice machine.

## VACUUM DRIES CONCRETE HOUSE WALLS

A NOVEL vacuum treatment which causes concrete to set within twenty minutes was used in making the walls of a demonstration house recently erected in Maryland. Pumps created a vacuum in molds placed around the freshly poured mixture so that excess moisture was sucked out and hardening took place immediately. The process is claimed to cut building time and insure strong, enduring walls.



Workmen erecting forms for walls and, left, pouring the concrete. Note hose for creating the vacuum



## MASK GUARDS AGAINST MOVIE SNOW

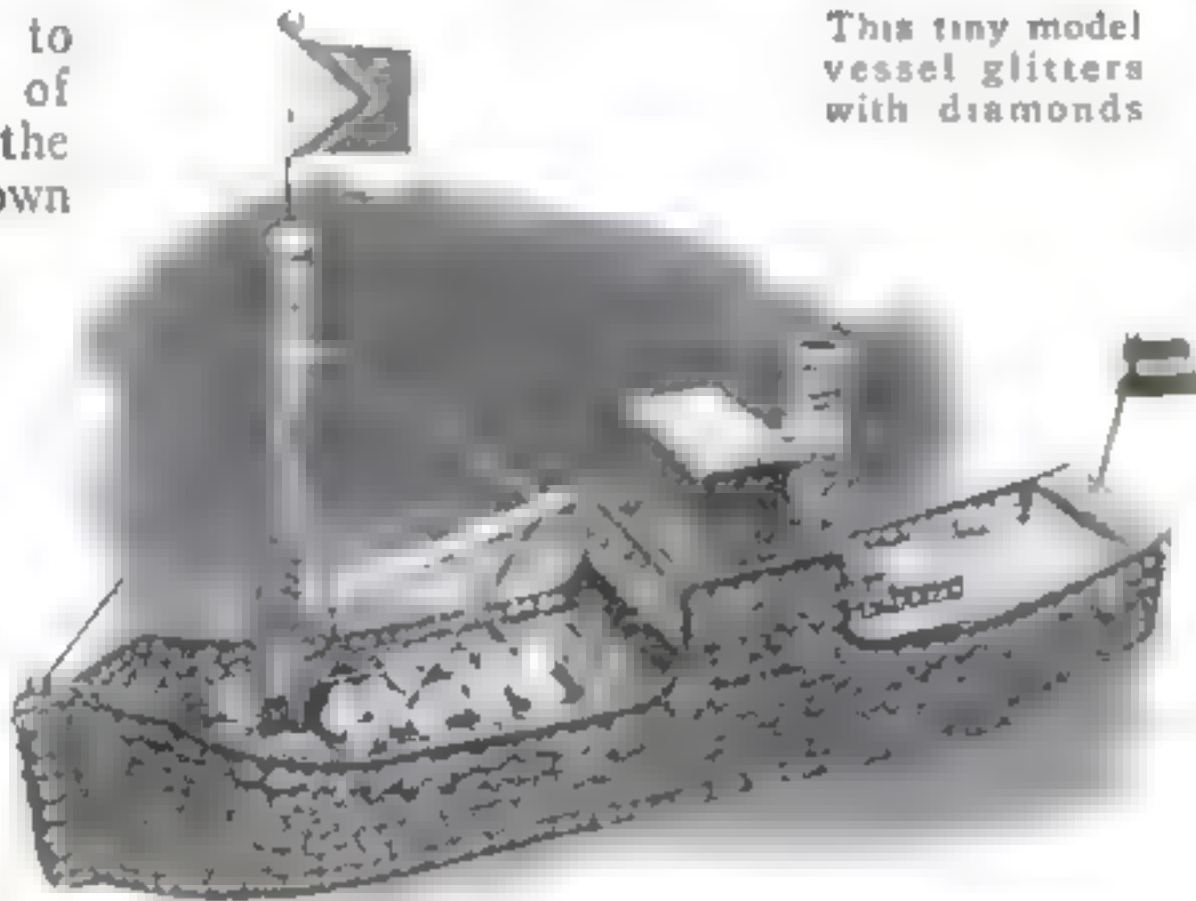


Clark Gable inspects Director Stahl's chicken-feather mask

BECAUSE he was abnormally sensitive to the chicken feathers being used as "snow" in a recent film, John Stahl, movie director, wore an odd protective mask made of gauze and held in place by a leather "harness." Although affording full protection to the director, the mask allowed him to give verbal directions to the actors who played in the snow scene.

## DIAMONDS DECORATE MODEL SHIP

STUDED from stem to stern with hundreds of sparkling diamonds, the unique boat model shown in the photograph at the right was an outstanding feature of a recent jewelers' exhibition. Although it measured only a few inches in length, the dazzling model was said to be one of the most valuable and carefully guarded objects to be placed on display.



This tiny model vessel glitters with diamonds



## POLICE TOWERS CONTROL TRAFFIC

SNARLED traffic along busy highways is untangled by California police with the aid of wooden control towers placed at strategic points in congested areas. Fitted with telephones and complete short-wave radio equipment, for communication with police centers and patrol cars, the towers provide convenient field headquarters for directing and coordinating traffic movements on main routes.

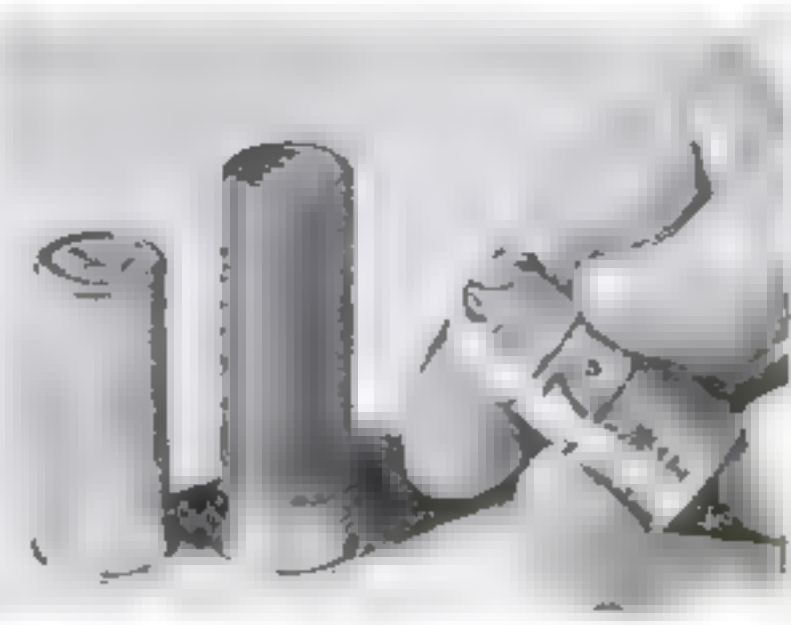


## HEADLIGHT-BULB TESTER WARNS OF BURN-OUTS

TO PREVENT automobile headlight bulbs from burning out without warning, a new tester has just been marketed. The bulb to be tested is slowly rotated in a plastic receptacle whose brilliant white background shows up in bold contrast those blackened portions of a lamp that indicate it is nearing the burn-out point.

## NEW SHOTGUN SHELLS ARE ALL-METAL

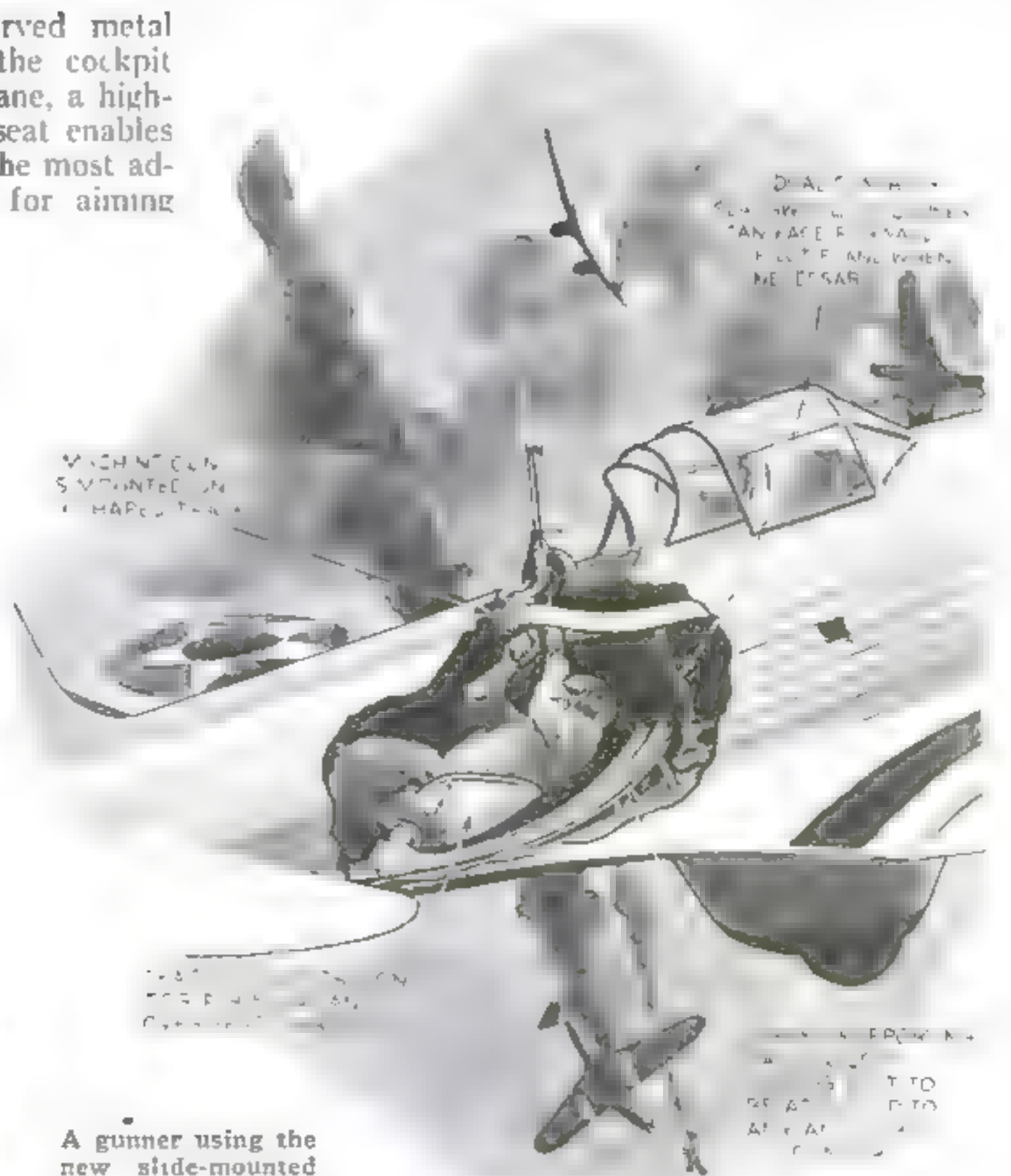
ALL-METAL cases for shotgun shells, recently introduced, provide hunters with a cartridge said to give a higher velocity and longer range than conventional paper-cased shells. Three quarters of an inch shorter than paper shells similarly loaded, the "tin-can" cartridges are said to be proof against damage by water.



Metal shells compared with one of paper


## SLIDING SEAT AIDS AIRPLANE GUNNER

SLIDING on a curved metal track mounted on the cockpit floor of a fighting plane, a high-backed, swivel-type seat enables a gunner to assume the most advantageous position for aiming and firing. Pulling a hand lever locks the gun chair in position, while the gun itself rides a suspended track and can be slid forward and stowed away. Both lateral and vertical firing are made more easy for the gunner by the ingenious invention.



A gunner using the new slide-mounted seat to fire straight up. The gun is hung on a separate track





# Battle OF THE Superliners

Contenders for the blue ribbon of the Atlantic. Note the larger visible wake and bigger bow wave created by the Queen Mary, at top

**W**ITH throttles wide open, oil flames roaring at full blast under twenty-six giant boilers, and with 12,000 more horsepower than she has ever used before whirling four new propellers, the turboelectric ship *Normandie* will soon sweep once more across the Atlantic in a determined effort to recapture the blue ribbon of speed supremacy.

During her winter overhauling in the great dry dock at Le Havre, France, the *Normandie's* long, sleek hull has been scraped clean and repainted; sixteen extra nozzles, admitting seven percent more steam to her four giant propelling turbines, have been opened up for the first time; new four-bladed propellers, designed to whirl smoothly at 230 revolutions a minute, boosting the driving turbines to their most efficient speed, have replaced reduced-speed propellers made to spin at 180 revolutions a minute.

Thus tuned up for maximum power and efficiency, the *Normandie* will reënter the race. No date has been set, as weather is a great determining factor, but engineers and officials of the French line are confident that before the coming season is over this mammoth ship will easily smash the records of 30.1 knots, westward, and 30.64 knots, eastward, set last summer by the

By **KENNETH M. SWEZEY**

*Queen Mary*, the fastest average speeds ever attained by any vessel across the North Atlantic.

Just as confident are officials of the Cunard-White Star Line that the French liner has already reached the limit of her speed. Should the *Normandie* surprise them and break the record, however, fires in the *Queen Mary* will burn hotter, propellers will whirl faster, and at an extra cost of thousands of dollars a trip this crack ship of Great Britain will be driven to the last one of her 200,000 horsepower, in an attempt to get the record back again.

National pride and commercial competition are, of course, involved in this thrilling and expensive contest between the two newest, biggest, and fastest ships in the world. The advertising value of a symbolic, though imaginary, blue ribbon; of a handsome trophy of sterling silver and gilt, the Hales Trophy, which stands more than half as high as a man; and of the slogan "The Fastest Ship in the World," is a goal in itself that cannot be overlooked.

To shipbuilders, naval architects, and marine engineers, however, the present rivalry means tremendously more. For the

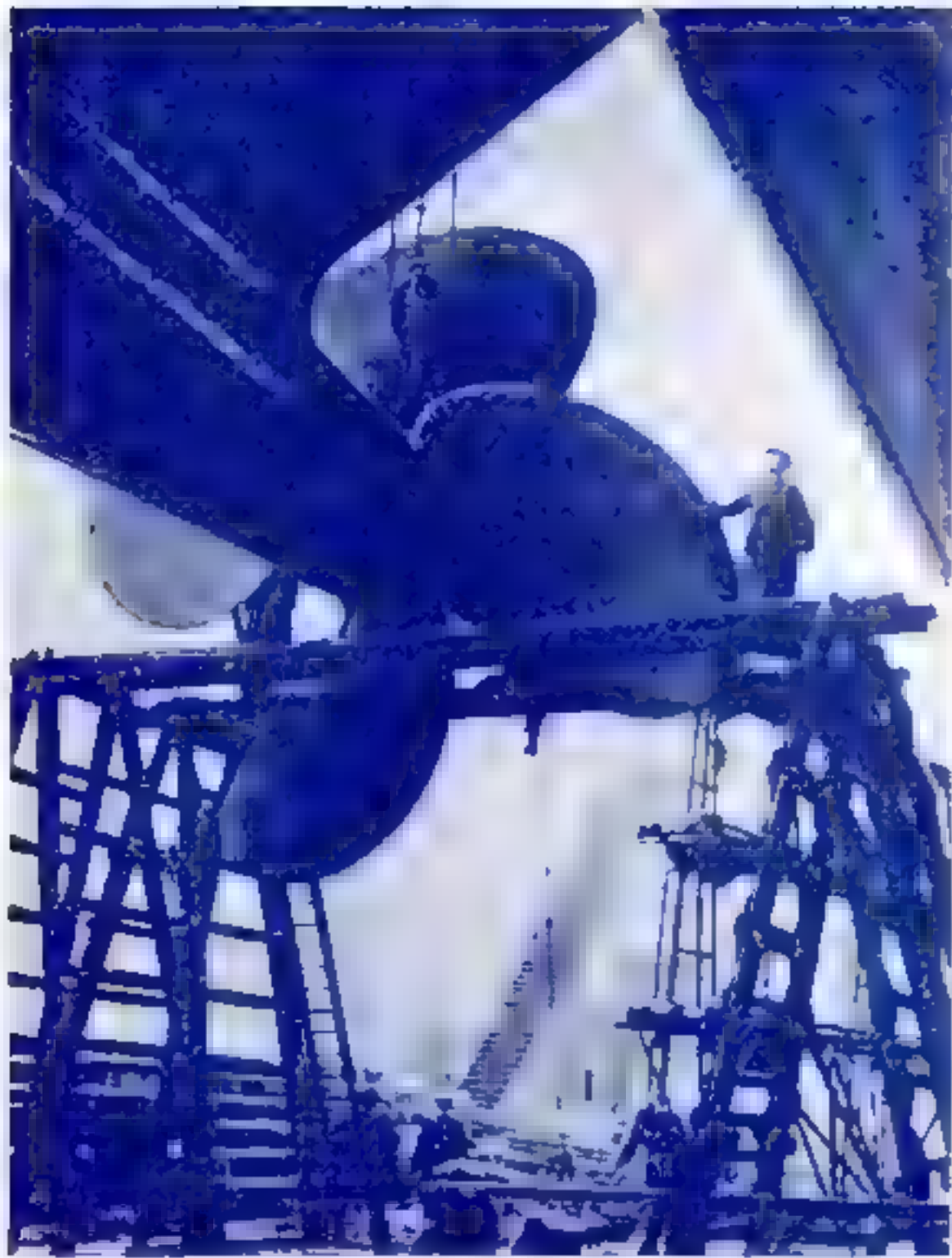
first time in the history of shipbuilding, two great ships so evenly matched in size, scheduled speed, and tonnage, and yet so different in dozens of fundamentals of engineering and design, cater to the same type of traffic and speed over the same course.

The whole Atlantic Ocean becomes at once a Gargantuan testing tank, in which 1,000-foot, 80,000-ton models, driven by engines as powerful as fifty express locomotives, sweep back and forth at destroyer speeds, putting to the final test some of the most perplexing problems in the marine design both of today and of the future.

Shall future big ships be driven by turbines connected to propellers by means of giant reduction gears, or by the more complex means of generators and electric motors? Shall hull lines continue to follow the conventional tracings of past record-making ships, such as the *Mauretania*, or is there justification for radically new forms? What may be said for bulbous and knife-edge bows; for cruiser and counter sterns? Is vibration unavoidable at high speeds? Are still higher speeds practicable? Do the *Normandie* and the *Queen Mary* mark the limit in size for superships?

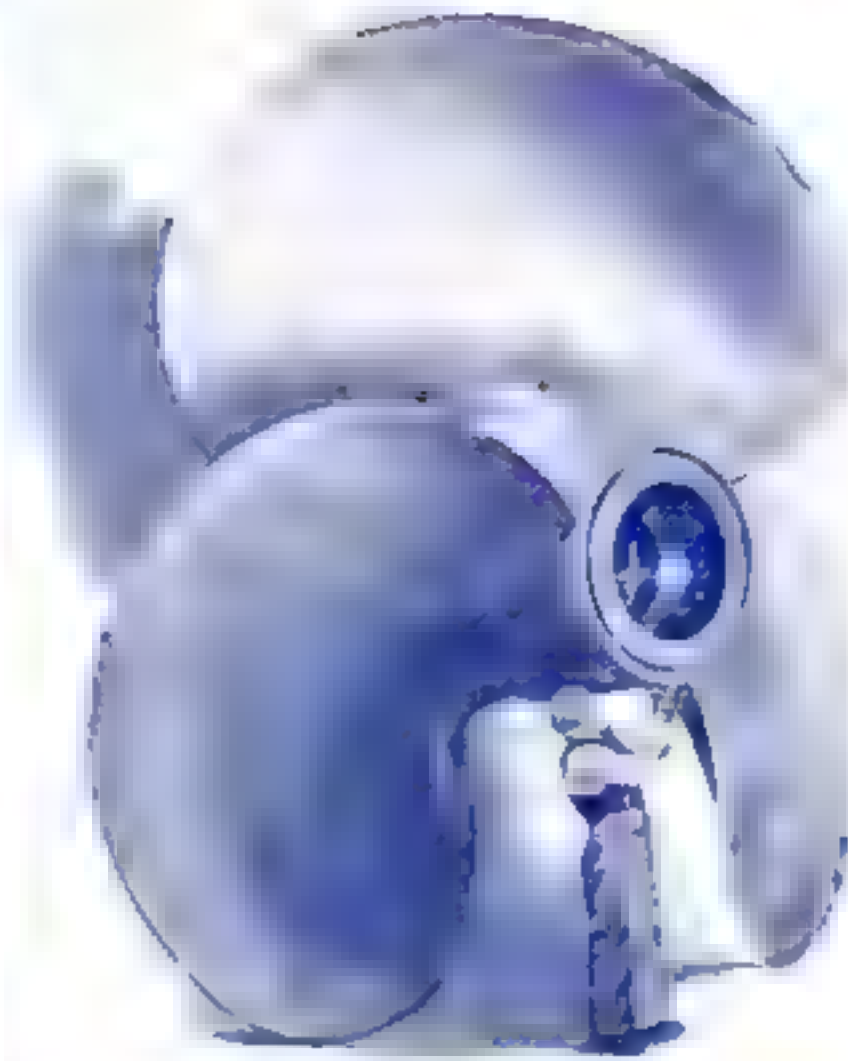
These are only a few of the questions that this amazing race may answer during





#### PROPELLERS ARE IMPORTANT IN STEAMSHIP DESIGN

This three-bladed propeller was replaced on the *Normandie* by one of four blades to reduce vibration. Left, one of the *Queen Mary*'s big thirty-five-ton, twenty-foot propellers



the coming months. If the winner is chosen by engineering standards, not only speed will count, but speed coupled with economy of power and the ability of the hull and machinery to stand the buffeting of year-around Atlantic service.

Luck, in the form of weather and sea conditions, often plays a large part in the outcome of an attempt at a record; but records, when made, are never the results of pure accident. One of the reasons is the cost of extra fuel, which mounts out of all proportion to the knot or two of extra speed. At her normal average of about 28.75 knots, the *Queen Mary*, for instance, burns about 1,100 tons of oil a day. On her record trip westward, with an average of only 1.26 knots greater, her fuel consumption jumped to 1,360 tons a day. With oil at about seven dollars a ton, the extra fuel for the one-way passage cost more than \$7,500! Imagine the fate of a chief engineer who would spend that much of his company's money without reason!

Strangely enough, the difference between the *Normandie* and

the *Queen Mary* which is most hotly disputed, the difference in size, is almost negligible. In that one respect, the two ships are so nearly identical that even experts cannot agree as to which should be called the bigger ship.

With size, however, similarity ends. From propelling machinery to shape of funnels; from design of the public rooms to the decoration of cabins, they are as radically different as are the countries which produced them.

One of these differences concerns the relationship between power and speed. From all indications (although the exact figure is still a dark secret) the *Queen Mary* has engines capable of developing at least 200,000 horsepower. According to her log, she has actually reached 189,000 horsepower

in practice. What will it mean, then, if the *Normandie*, with a maximum horsepower of only 179,000, should better the present record?

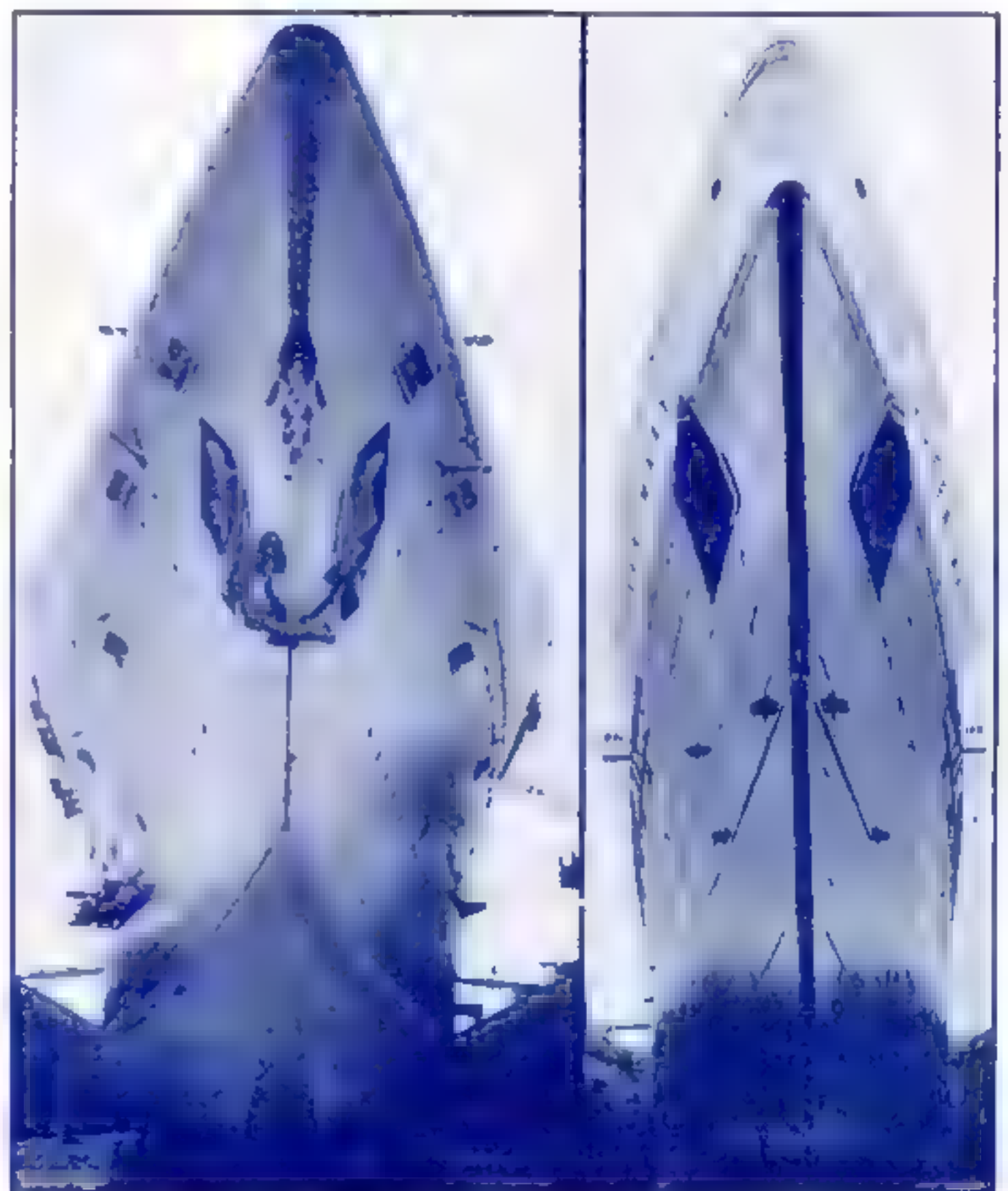
It will mean one of two things: either that the *Normandie* was favored with better sea conditions, or that her strange underwater hull lines, based on new scientific principles and here used for the first time in a big ship, create less resistance than the more conventional lines of the *Queen Mary*. V. I. Yourkevitch, noted naval architect who designed the *Normandie*'s hull, is confident that, power for power, the new lines make the *Normandie* the faster ship.

The selection of the underwater hull shapes for the two ships is an amazing example of how separate groups of engineers may tackle the same problems, observe the same phenomena, and arrive at entirely different conclusions.

For more than two years, in testing tanks at Clydebank, Scotland, Paris, France, and Hamburg, Germany, British and French engineers studied the problems of hull resistance for their respective ships. Thousands of experiments were conducted. More than thirty sixteen-foot models were towed at various speeds through artificial wave systems reproducing to scale every storm condition met on the North Atlantic. With sensitive instruments, records were made of resistance and pitching angles in various combinations of model speed, wave length, and wave height. Prolonged investigations were made to determine the most efficient angles of stern tubes, and the direction of rotation, position, size, and type of propellers. Hundreds of feet of movie film were shot to record permanently the behavior of the models in the waves. *(Continued on page 118)*



Below, a scene on the bridge of the British ship. The hand wheel is for maneuvering



Important differences in design are apparent in these contrasting views. The *Normandie*'s bow, at left, is bulbous; the *Queen Mary*'s, knife-edge



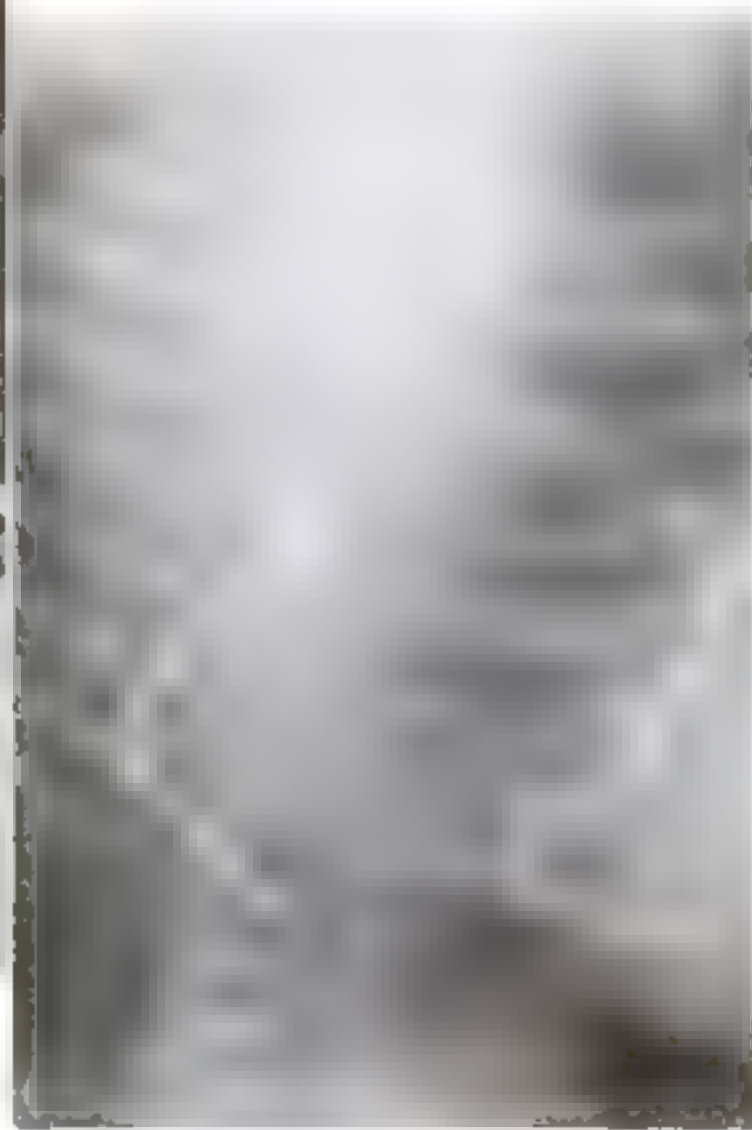
# Strange Things That

*In This Article the Author Relates Some Amazing Stories of Cases in Which Foreign Objects Have Wandered Through the Channels And Tissues of Living Persons and Animals*

By **FREDERIC DAMRAU, M. D.**



A surgeon about to insert a bronchoscope into a patient's throat to remove a foreign object such as the open safety pin that can be seen in the X-ray photograph at the right



**O**NE DAY, a few years ago, a laborer ran a small sliver of wood into his thumb. That simple occurrence started a train of events that produced one of the strangest cases in medical history.

The man worked in the shipping department of a large factory. Because he often picked up splinters from packing cases, he carried a small needle in his vest pocket for removing them. This time, after getting the sliver out of his thumb, he thrust the needle back into his pocket. He was bending over at the time, and felt a sharp, pricking sensation in his chest. That night, he was alarmed to find the needle gone from the pocket, and a bright red spot on his skin. An X-ray examination revealed that the needle, already out of sight, was working its way through the chest muscles toward the man's heart!

That was the beginning of its almost incredible journey.

Before it could be removed, its point had passed into the left ventricle of the heart. Surgeons performed a delicate operation, but failed to catch the wandering piece of metal. After the operation, the patient rallied, although an X ray showed that the needle now was protruding from the other wall of the heart. Moving a fraction of an inch a week, the bit of steel worked toward the back, finally lodging near the spine, where it was easily removed.

Unbelievable as it seems, the laborer is alive today, after having a steel needle travel straight through his chest, piercing his heart on the way.

And that is but one of many fantastic events of the sort recorded in the case

books of physicians. If you give your imagination full play, if you let it conjure up the most far-fetched event it can, the chances are the result will be less bizarre than many true stories of objects that wander through the human body.

Take another instance, which I encountered only the other day. In some ways, it is the queerest of all.

Many years ago, the small daughter of a physician had a hobby-horse of which she was particularly fond. Its mane was of real horse-hair. As children will, she used to pull out hairs and chew them, and on at least one occasion she accidentally swallowed one.

One morning, when she was seventeen years old, she felt an itching in one of her big toes. What appeared to be a dark sliver lay under the skin. With a needle, she began to work it out. To her bewilderment, the supposed sliver pulled out farther and farther. Without experiencing any pain or producing bleeding, she drew a long horse-hair from her foot!

For nearly a dozen years, the hair had been migrating about within

the body of the growing girl. It had finally arrived at the opposite extremity from the point where it had entered!

How are such journeys possible? How can foreign objects pass through "solid flesh"? How can they travel from one end of the body to the other? What makes them move? These and a host of other questions spring into our minds when we consider these mystifying cases.

The commonest mode of travel is through the natural channels—the digestive tract, the veins and arteries, the bronchial tubes, and the air passages of the lungs. Objects travel fastest in the circulatory system, as it requires but half a minute for the blood to make a complete circuit of the body. In passing through the solid portions, foreign objects usually slide between the layers of muscles and tissues. Contraction and expansion of the muscles, the beating of the heart, and the movements produced by breathing and digestion push the objects along on their strange migrations.

But why they follow certain courses or



Removing what seemed to be a splinter from her toe, a young woman found a long horsehair she had swallowed years before



# Roam Through the Body

move as they do, is often an incomprehensible mystery. For instance:

A few years ago, a seamstress was holding several needles in her mouth while she sewed. A sneeze caused one of them to slip down her throat. Ten days passed. Then, about three inches below the breastbone, the eye end of the needle appeared through the skin. Why it had worked its way out blunt-end-first is a question no one can answer.

I recall another case in which a swallowed needle broke into three parts and each one came out at a different point on the body. A month after the accident, the first piece was taken from the lining of the abdominal cavity by surgeons. Six weeks later, the second piece worked its way through the skin on the left side of the abdomen and, in another three weeks, the remaining bit of metal, this time the point of the needle, appeared just below the breastbone. Why did the sharpest part, the point, take the longest time to reach the surface?

Equally puzzling are other journeys made by bits of metal. One fragment entered near a man's knee and came out through the skin of the chest; another disappeared down a gullet and reappeared behind a left ear; a third entered the body at the mouth and left it at the calf of the leg. Like the feats of a stage magician, who apparently pulls rabbits from hats and fountain pens from ears, are these actual occurrences, familiar to medicine.

Not long ago, a southern physician, Dr. Harry J. Warthen, carried on a series of experiments with dogs. Inserting small objects in the veins of the animals, he kept a log of the journey made by each bit of metal, watching its progress by means of X rays. Invariably, he found, the metallic objects reached the hearts of the animals, irrespective of the effect of gravity or the



## SOME PEOPLE WILL EAT ANYTHING

A vaudeville performer ate electric-light bulbs for years without serious trouble. Below is a trayful of metal objects recovered from the stomach of a Canadian woman



position of the dogs. Bullets lodged in the human body sometimes follow a similar path.

A dramatic instance of the kind occurred several years ago in California. Two boys were hunting rabbits with .22 caliber rifles. While they were crawling through a tangle of brush, one of the young hunters accidentally discharged his gun and the bullet penetrated the thigh of the other boy. At the hospital, doctors X-rayed the thigh but could find no trace of the lead. Later, the

boy complained of a pain in his heart. An X-ray examination was made, and the fluoroscope showed that the bullet, which had been carried in the blood stream of a vein, was making an elliptical circuit within one of the chambers of the heart, spinning at every beat like a bit of driftwood caught in a whirlpool. One of those amazingly skillful operations which modern surgery has made possible enabled experts to reach the heart and remove the lead.

Last year, a little Australian boy dashed halfway around the world with a nail in his lung. He traveled 9,000 miles to Philadelphia, Pa., to see Dr. Chevalier Jackson, who has become famous for extracting foreign objects from the lungs and bronchial tubes. In seven minutes, this expert removed the nail by a bloodless operation.

But back of those few minutes of skillful work lay some thirty years of constant practice. And the tools Dr. Jackson used represented the perfection of thousands he has invented to aid him in the operating room. His bronchoscope, now used in all parts of the world, is essentially a hollow metal tube with a small electric light at the end. Through it, after it has been slipped down the throat of the patient, the expert works with long, slender instruments—delicate tools that can close safety pins, cut up metal, grip like pincers, or lift like teaspoons.

In two and a half minutes, on one occasion, Dr. Jackson extracted a shawl pin from a woman's lung where it had been lodged for twenty-two years. By another operation, he took about seven minutes to remove a screw which had remained in a patient's lung for almost forty years. Of his last 3,000 operations, ninety-eight percent have been successful. A museum in Philadelphia (Continued on page 120)



A surgeon preparing for a bloodless operation to remove a wrist watch, a pair of dice, and a few other things that had been swallowed by a dog



# HOW TO GET THE MOST OUT OF Your Trailer Trip



The author's trailer passing George Washington's mill, a historical landmark that has recently been reconstructed close to Mount Vernon, Va.



The evening paper is delivered by a newsboy at the big camp for trailer tourists in Sarasota, Fla.

By EDWIN TEALE

OUR car rolled out under a street lamp in a wide turn down the avenue. It was three o'clock in the morning. Behind us, the trailer loomed large in the darkness. It was packed with food, clothing, and equipment. The preparations, described in the first article of this series, were over. We were off for five weeks on the gypsy trail.

Our ultimate goal was the great trailer camp at Sarasota, Fla. Our destination for the day was Washington, D. C., 250 miles from the starting point at Baldwin, N. Y. We were leaving before dawn to reach the biggest hurdle of the trip, New York City, while traffic was at its lowest ebb.

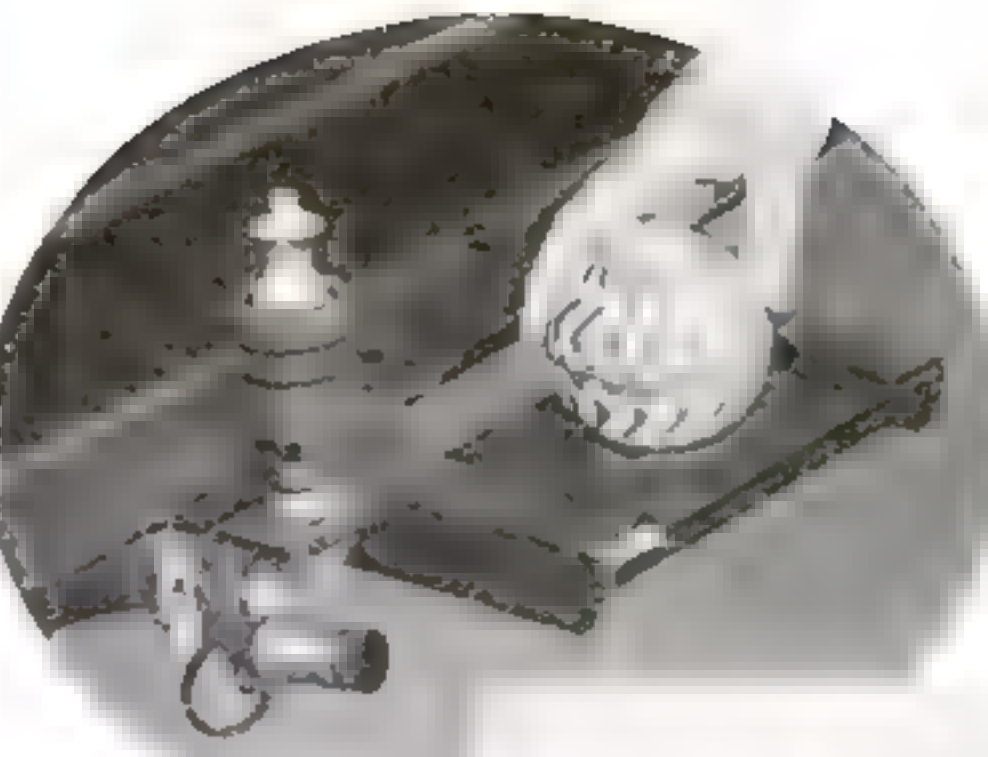
For more than an hour, car and trailer sped through slumbering Long Island villages and down deserted highways. It was half past four when we crossed the Queensboro Bridge and plunged into the maze of New York streets. It was like hitting tissue paper when you expected solid brick. Fifth Avenue was deserted. We sailed past the Empire State Building with only a lone taxicab in sight. In less than thirty minutes, we were speeding under the Hudson River through the white tube of the Holland Tunnel. Manhattan lay behind us.

The toll for going through the tunnel was seventy-five cents, a quarter for each pair of wheels on the car and trailer. Fog was creeping over the Jersey meadows, and by the time we reached the Newark Airport we moved like a beetle crawling through cotton batting. Eight o'clock found us beyond the fog and pulling up at a roadside restaurant. We had driven 100 miles before breakfast.

The rest of that day, both my wife and I experienced a curious sensation. Old-timers of trailer travel tell me they recall a similar feeling. The trailer seemed to shrink. It ceased to overawe us. At first, we had looked back every few minutes to make sure it was there. Now we sailed along for hours at a time, enjoying the scenery, without giving a thought to our tow. We rolled on and off the Delaware

A next-door neighbor in camp shows the results of a day's fishing in the near-by gulf





A clever trick for keeping the knob of the car's hitch free from dirt and rust is to slip over it an ordinary rubber ball with a hole cut in the bottom, as illustrated at left

This trailer household is comfortably settled. Note the shell-bordered walk in the floored porch, and the dog

## This Article Is the Second of a Series Describing A 5,000-Mile Journey in a Modern "Home on Wheels"

River ferry at New Castle, Del. We navigated a fifteen-mile detour over narrow roads near Elkton, Md. We threaded our way through the crowded streets of Baltimore. We were within fourteen miles of Washington when I made an alarming discovery.

The rear bumper on the car was coming loose. Peering under the machine, I discovered that the mechanic who had installed the hitch had fastened the two ends of the metal V to the chassis and then had clamped the middle to the bumper. Thus, the weight of the trailer, magnified by lever action, was pulling down on the bumper and threatening to tear it off. Later, in one Florida camp, I saw a roadster which had been equipped with a similar hitch. The bumper was pulled off and part of the rear end torn away. We were more fortunate. By nursing the trailer along as though it carried T.N.T., we reached Washington and turned into the municipal camp on the Potomac just before dusk.

In spite of our narrow escape, we were safe and sound.

Then, I tried to attach the extension cord to light the trailer lamps. The connection required a screw plug; the agency had supplied one with prongs. We went to bed in the dark. So ended our first day of trailer life.

It is only fair, however, to run ahead a little in my story and point out that all our grief came in the first twenty-four hours. For more than a month afterwards, we traveled in all kinds of weather and over all kinds of roads, and the trailer gave us not one minute of trouble. The next day, I had the hitch altered by a Washington mechanic. Undoubtedly, as trailers become standardized, the trouble with hitches will disappear. One large automobile concern is reported to be experimenting with a demountable hitch which can be adopted as a standard accessory on its cars.

If you are making a long trailer trip, it

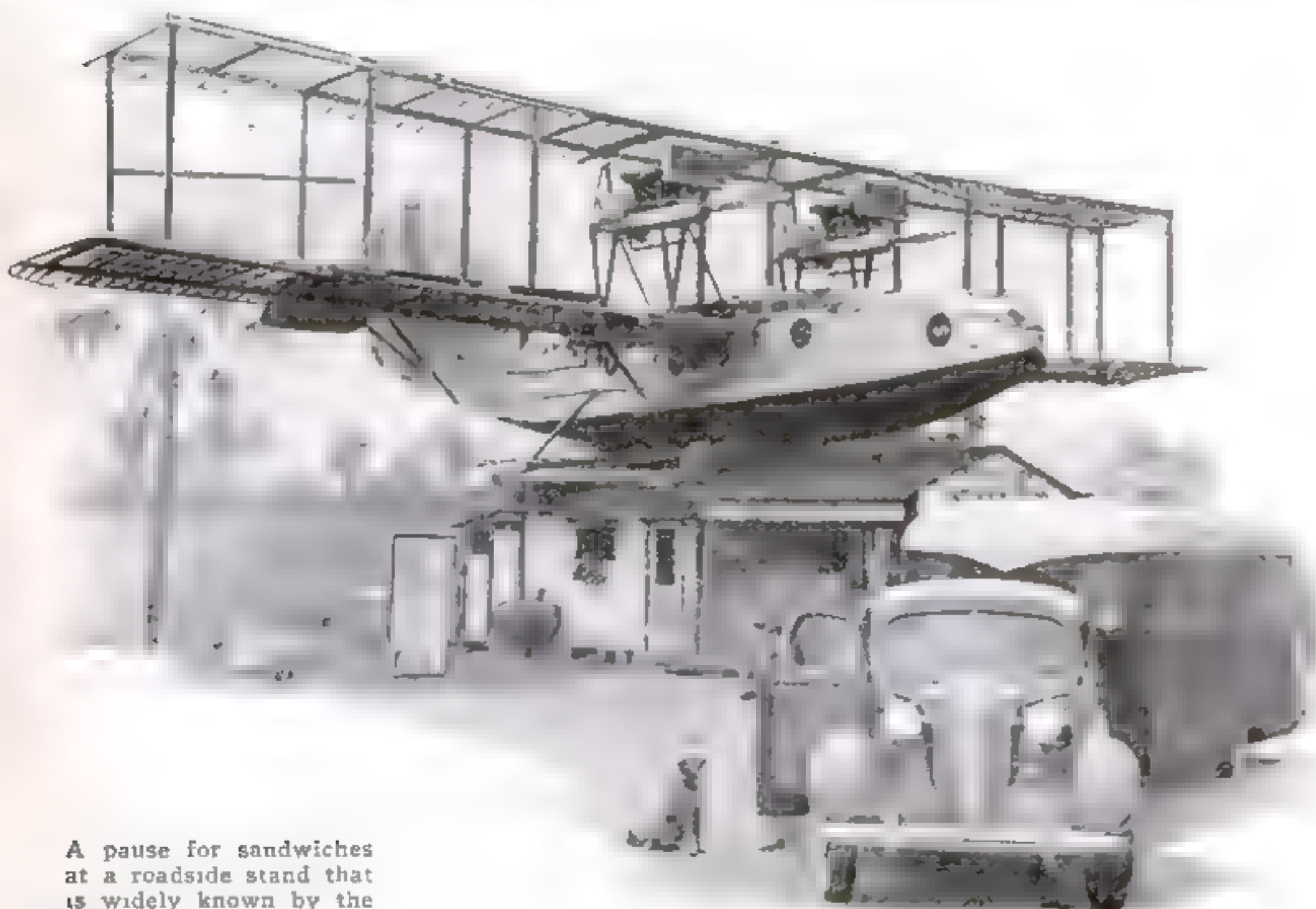


Looping the trailer's extension cord around the wire keeps the plug from pulling loose

pays to have helper springs installed on the rear of your machine to absorb some of the strain. These cost anywhere from twelve to eighteen dollars, depending on the type of car and the part of the country where the work is done.

Washington gave us our first glimpse of life in a trailer camp. We paid our sixty-five cents for the first night's rent, and were turned loose in a great field surrounded by Lombardy poplars. Across the field ran rows of trailers—red, yellow, blue, white—all connected by dangling cords to the overhead wires that supplied current for lights and radio. Beside one trailer sat a black cat wearing a brass-studded harness; beside another, a black-and-white setter. Wherever we went, we saw trailer pets that seemed perfectly contented in their rolling homes. One of the strangest sights we saw on the whole trip was a small homemade trailer, rushing past us down a southern road, with a large pet rooster clinging to the top.

On the grounds at the municipal camp were showers, laundries, a store, and a restaurant. During the summer season, a mechanic is on hand to repair trailers and cars. Each afternoon, scores of visitors drove up and down the streets of the trailer park, looking over the different outfits and asking questions *(Continued on page 102)*



A pause for sandwiches at a roadside stand that is widely known by the seaplane perched on top

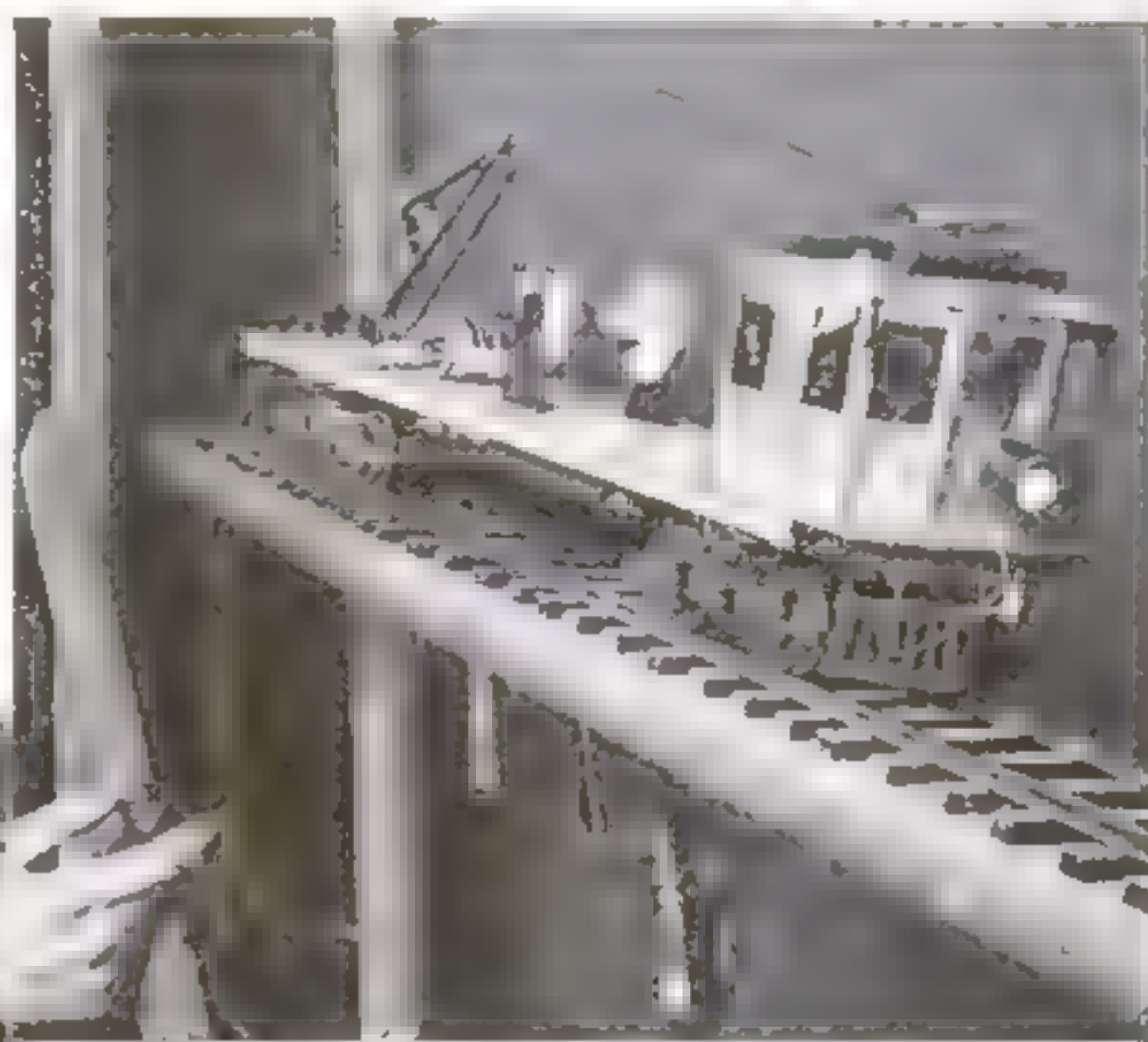




## OUTDOOR MINIATURE RAILROAD USES MAGNETIC BRAKES

Demonstrating electric brakes with a work car on an incline. Pressing button "sets" the brakes

Underside of a car truck, showing how electromagnets are set above the rails

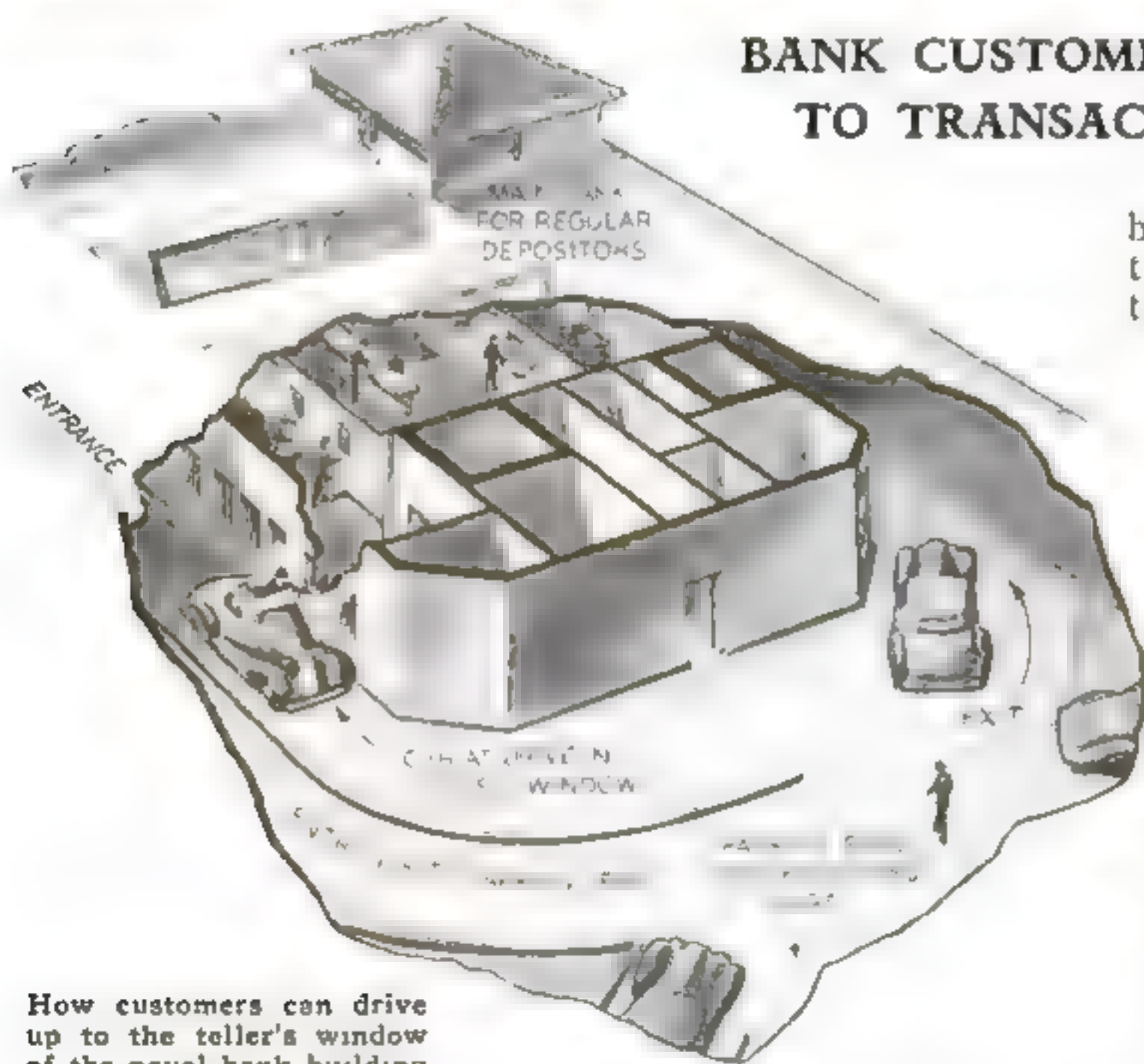


E. Jay Quinby operating a train on his private railroad

**R**UNNING day and night, winter and summer, a mile-long outdoor miniature railroad constructed by E. Jay Quinby of Yonkers, N.Y., is an exact scale reproduction of an actual railroad system.

Current supplied from overhead wires drives the rolling stock along tiny rails fastened to creosoted ties on a rock-ballasted roadbed. In addition to locomotives, freight cars, and coaches, the equip-

ment includes an electrified work car and a model snowplow that clears the track in winter. Power houses, trestles, tunnels, and stations are durably constructed of iron and concrete. An electric brake system utilizes tiny electromagnets suspended above the rails from the trucks. These are energized by a remote-control button, causing the magnets to exert a pull on the rail and bring the cars to a stop.



How customers can drive up to the teller's window of the novel bank building

## BANK CUSTOMERS DRIVE IN TO TRANSACT BUSINESS

IN A novel "auto bank" nearing completion in California, patrons will be able to make deposits and withdrawals without leaving their automobiles. A depositor will drive into the building along a runway, stop at a teller's window, and drive out by another passage. Customers having more detailed business can leave their cars in a ventilated parking area in the rear of the bank building, and enter the lobby through a door in the rear.



At left, how the pencil is used in writing



Right, the eraser is pushed forward for use

## ERASER SLIDES OUT OVER PENCIL POINT

TO MAKE erasing easier and quicker, a new mechanical pencil has an eraser on its writing end. Fastened to a spring-operated collar, the eraser is ready for use when pushed forward beyond the lead. When pressure is released, the spring snaps the eraser back up the pencil shaft, out of the user's way.

## ELECTRIC RAZOR RUNS ON DRY CELL

A NEW electric razor just introduced by a French manufacturer operates on a single flash-light battery placed in its hollow handle. Twisting a button on the handle end starts an electromagnetic vibrator that moves the cutting blade in a lateral direction thousands of times a second. For best shaving results, the razor should be held flat against the face of the user.



New electric razor and the flash-light cell that operates it

## SNIPERS TRAINED BY DUMMY TREE STUMPS



Soviet sharpshooter and observer practicing in dummy tree stumps

ARTIFICIAL tree stumps set up on a Russian rifle range help train Soviet sharpshooters to fire from cramped quarters and inclosed spots where it is difficult to aim accurately. In the photograph at the left, an observer in the right-hand "stump" peers through field glasses to check the target hits made by the sniper, who is shown in the foreground.



## ELECTRICITY RUNS CLERKLESS GROCERY STORE



At left, customers are "ordering" merchandise. Right, cashier plugging key into master slot to deliver goods



**E**LECTRICITY replaces floor clerks in a novel self-service grocery store just opened in Memphis, Tenn. A customer simply inserts an "electric" key into slots opposite the glass-encased food items she wants to buy. This actuates a master control mechanism which records each choice. When the shopping is completed, the cashier plugs the customer's key into a master socket, the goods ordered come out of a chute from the storage shelves, and an adding machine totals the cost.

## PORTABLE REFRIGERATOR TESTS CORN



Agricultural experts lowering an electric refrigerating unit over a hill of corn to determine the plants' ability to withstand cold weather

**LOWERED** from a scaffold over hills of corn, a portable refrigerating unit developed by the U.S. Department of Agriculture is being used to aid in selecting the hardiest varieties for planting in rigorous northern climates. Electrically operated and thermostatically controlled, the agricultural freezer is designed to duplicate natural conditions encountered during heavy frosts and cold snaps. Instruments are read by a warmly clad technician within the box.



## GAS STOVE FOR TRAILER USES COMPRESSED FUEL

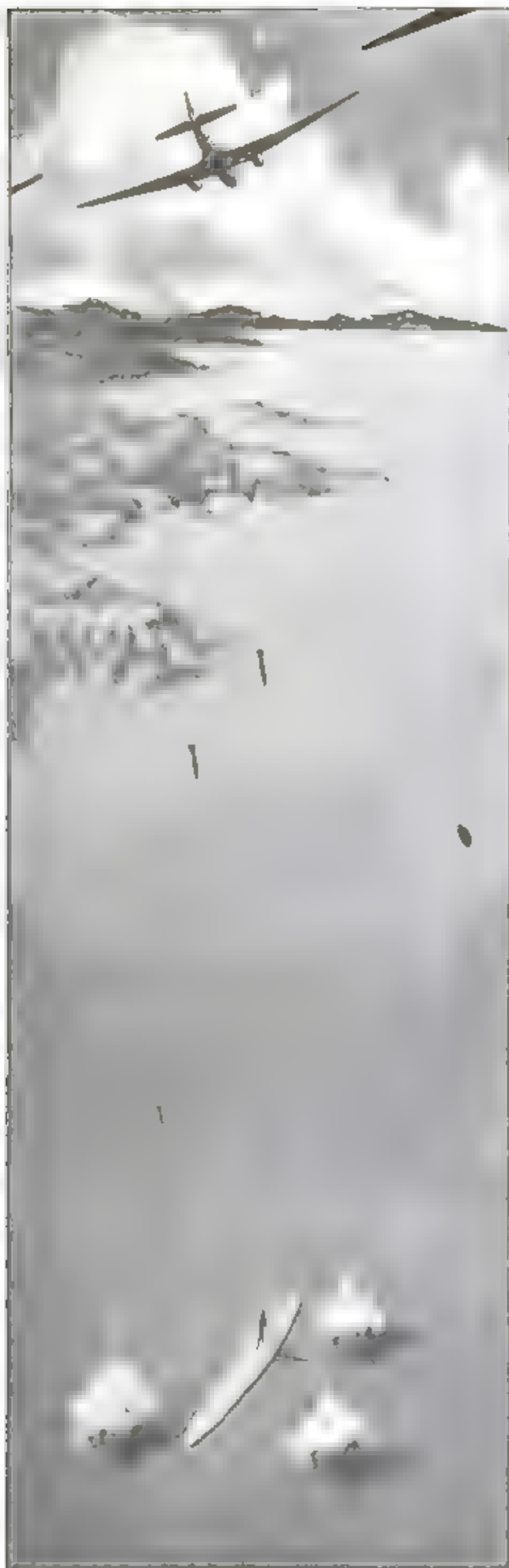
**TRAILERS** now can be supplied with cooking gas, with the introduction of a fuel unit that fits under the trailer floor. Highly compressed into a liquid that becomes a gas when released, the fuel is stored in a metal cylinder that provides a five-weeks supply. A reserve cylinder is used while the other is being recharged.

## RAZOR-BLADE TOOL OPENS PAPER BOXES

**UTILIZING** razor blades, a new cutting tool quickly opens paper or cardboard boxes. Slid along the edges of the top or a side, the cutter neatly slices the box open. The blade is adjustable to any depth so that it will not injure the box contents.







## DUMMY SHIPS ON WHEELS TRAIN ARMY BOMBERS

TOWED at the rate of thirty-five miles an hour over the dry bed of Muroc Lake in southern California, full-size dummy destroyers and battle cruisers, made of wood and canvas and mounted on wheels, will provide moving targets for bombing planes of the U. S. Army Air Corps. Marked to indicate gun turrets and other vital spots, the cloth-covered skeleton warships will be hauled at the end of cables from 1,000 feet to half a mile in length in order to insure the safety of the operators of the towing vehicles. The 200,000-acre lake bed, ten miles long and five miles wide at the ends, is large enough to permit trucks and tanks to maneuver the ten-ton targets in zigzag courses to simulate the erratic movements of ships at sea that are attempting to change their courses and rate of speed in an effort to escape bombardment from enemy planes.

## DEVICE TESTS VOICES OF MOVIE STARS



Nan Grey, film actress, talking into a machine that analyzes voices

DURATION, pitch, timbre, and intensity of spoken sounds are visibly recorded by a new machine now in use for correcting the speech faults of film stars. Developed by an English physicist, the instrument registers the voice as a series of fluctuating lines on a moving strip of paper. By analyzing the recorded sound track, acoustical experts can determine how the voices of actors will register on studio sound-recording equipment.

## ODD PICTURE SHOWS DIVE OF PENGUIN

RESEMBLING a white-throated land bird swooping down on a butterfly, a diving penguin was caught in the odd position shown at the right by a photographer at the London zoo. The novel shot was taken through the glass wall of the penguin tank, as the antarctic bird plunged under water in pursuit of a morsel of food.

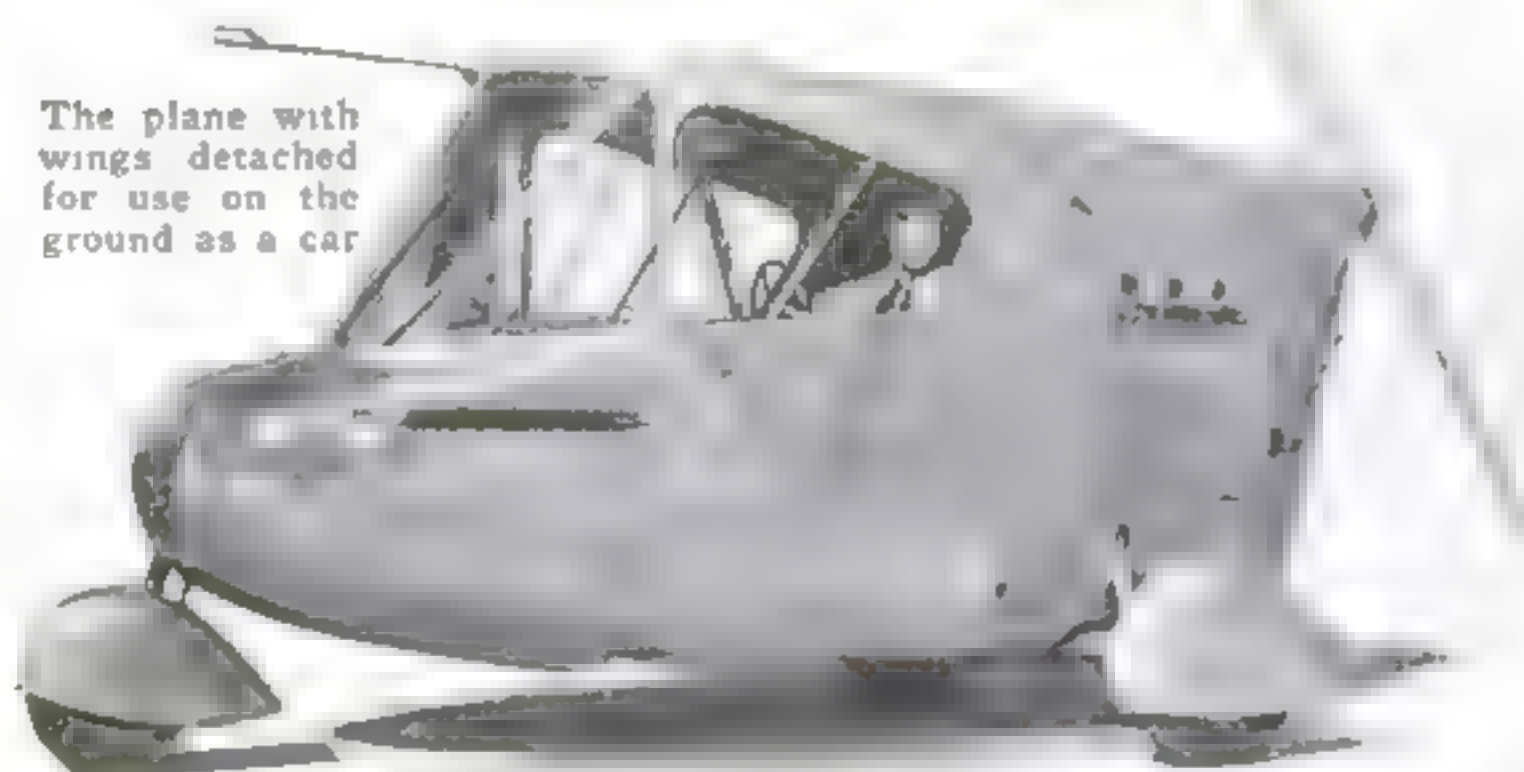


This remarkable underwater shot was made through a glass tank wall

## PLANE SHEDS WINGS TO RUN ON GROUND

DETACHABLE wings enable a vehicle of odd design to travel on the ground as well as in the air. Capable of attaining a speed of 110 miles an hour while flying and fifty-five on the ground, the novel craft is powered by a standard six-cylinder automobile engine.

The plane with wings detached for use on the ground as a car



The auto-plane making a landing. In the air, it is capable of a speed of 110 miles an hour





### DUST JACKETS PROTECT HOTEL-ROOM GLASSES

As a sanitary measure for the protection of guests, a Detroit, Mich., hotel now provides drinking glasses wrapped in a transparent cellulose material. After a guest departs, a sterilized glass, protected from dust and germs by the cellulose coating, is placed in the room before the next occupant moves in.



### DUFFEL BAG IS PUMP FOR AIR MATTRESS

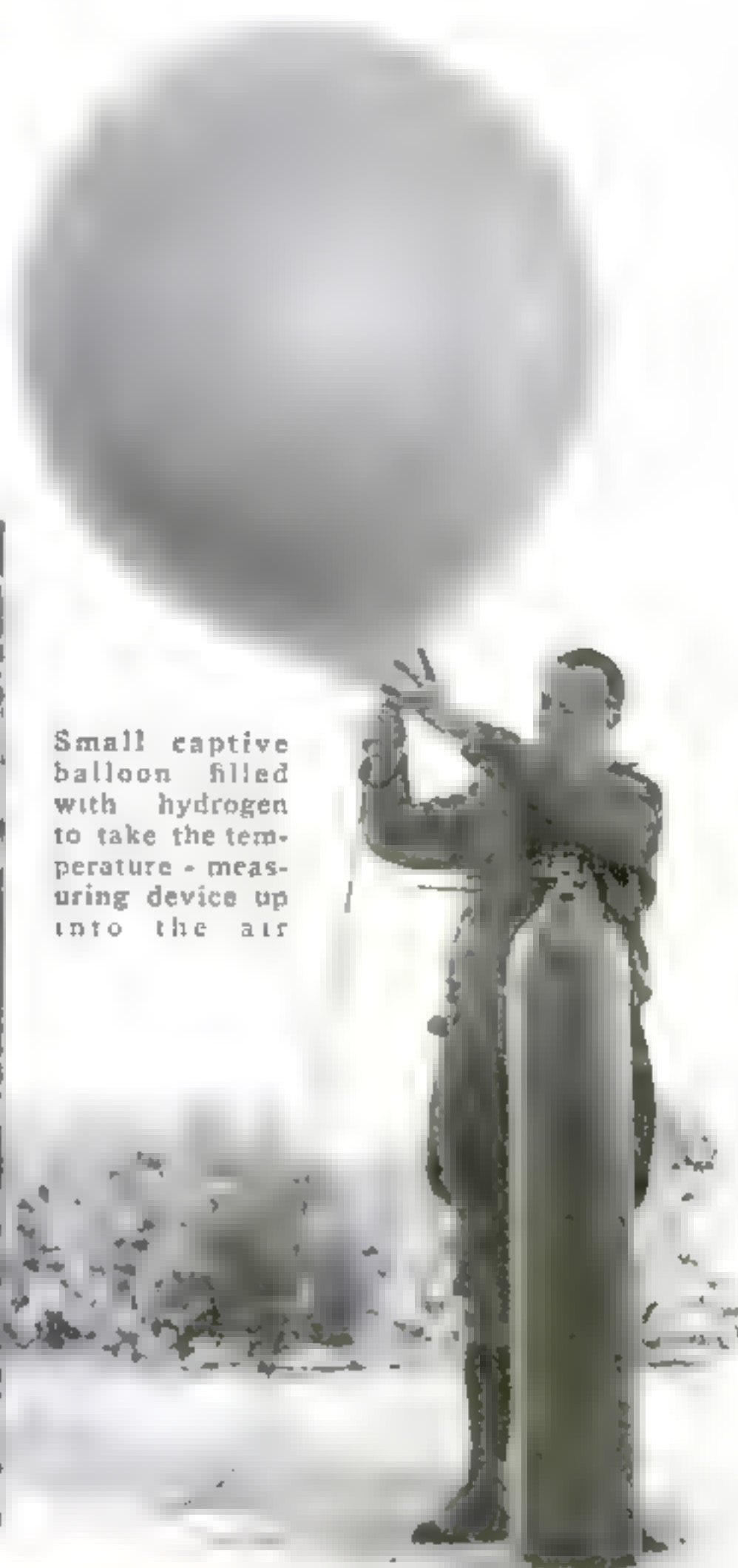
A HANDY innovation for campers is a duffel bag which, when empty, can serve as a pump for inflating an air mattress or cushion. Sticks inserted in loops are used to spread the mouth of the bag, and are snapped together quickly to imprison air. Rolling up the bag then compresses the air and forces it out through a hose connection into the mattress. The fabric of the bag is said to be water-tight as well as air-tight.

## BALLOON THERMOSTAT GUARDS FRUIT

SUSPENDED from a captive, hydrogen-filled balloon floating above an orchard, a new thermostatic apparatus used for the first time this past winter warned citrus-fruit growers of sudden drops in temperature. Devised by Dr. Irving P. Krick of the California Institute of Technology, the device flashes red and white lamps alternately. By timing the intervals between light flashes, attendants were able to determine when to take protective measures against frost.



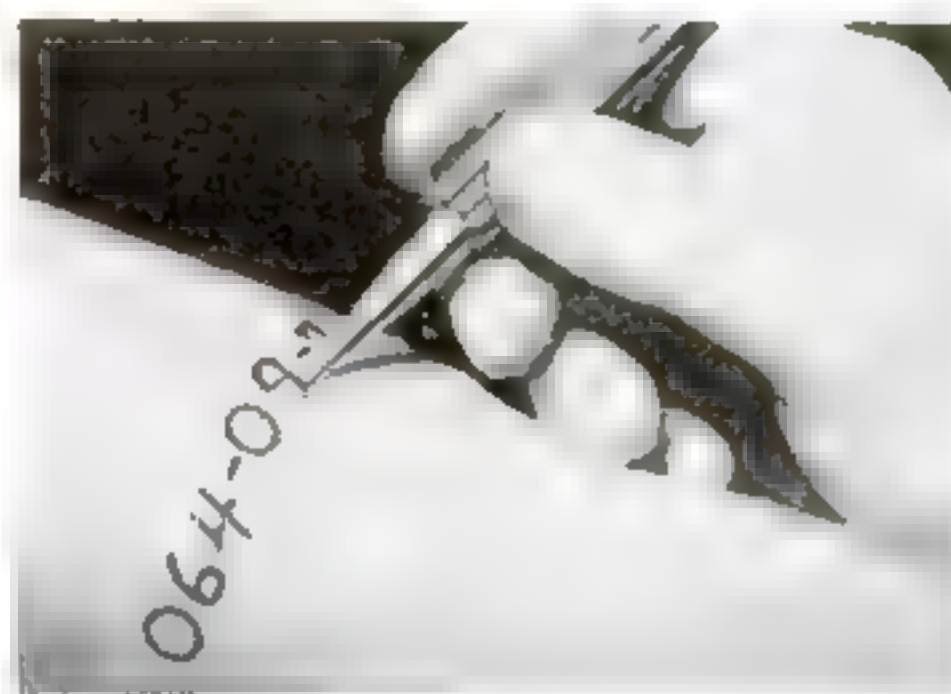
Lights flash to give warning of sudden cold



Small captive balloon filled with hydrogen to take the temperature-measuring device up into the air

### HAS SECURITY NUMBER TATTOOED ON ARM

FEARING that he might misplace his identification card or forget the number assigned to him by the Government under the Social Security Act, a New York man recently had the numerals tattooed on his forearm, as shown in the photograph at the right. Now, when he reaches the pension age of sixty-five, he can produce his number merely by rolling up his sleeve.



Social Security number being tattooed on skin



New pulling and lifting tool in use for stretching highway guard cables. It is shown at right

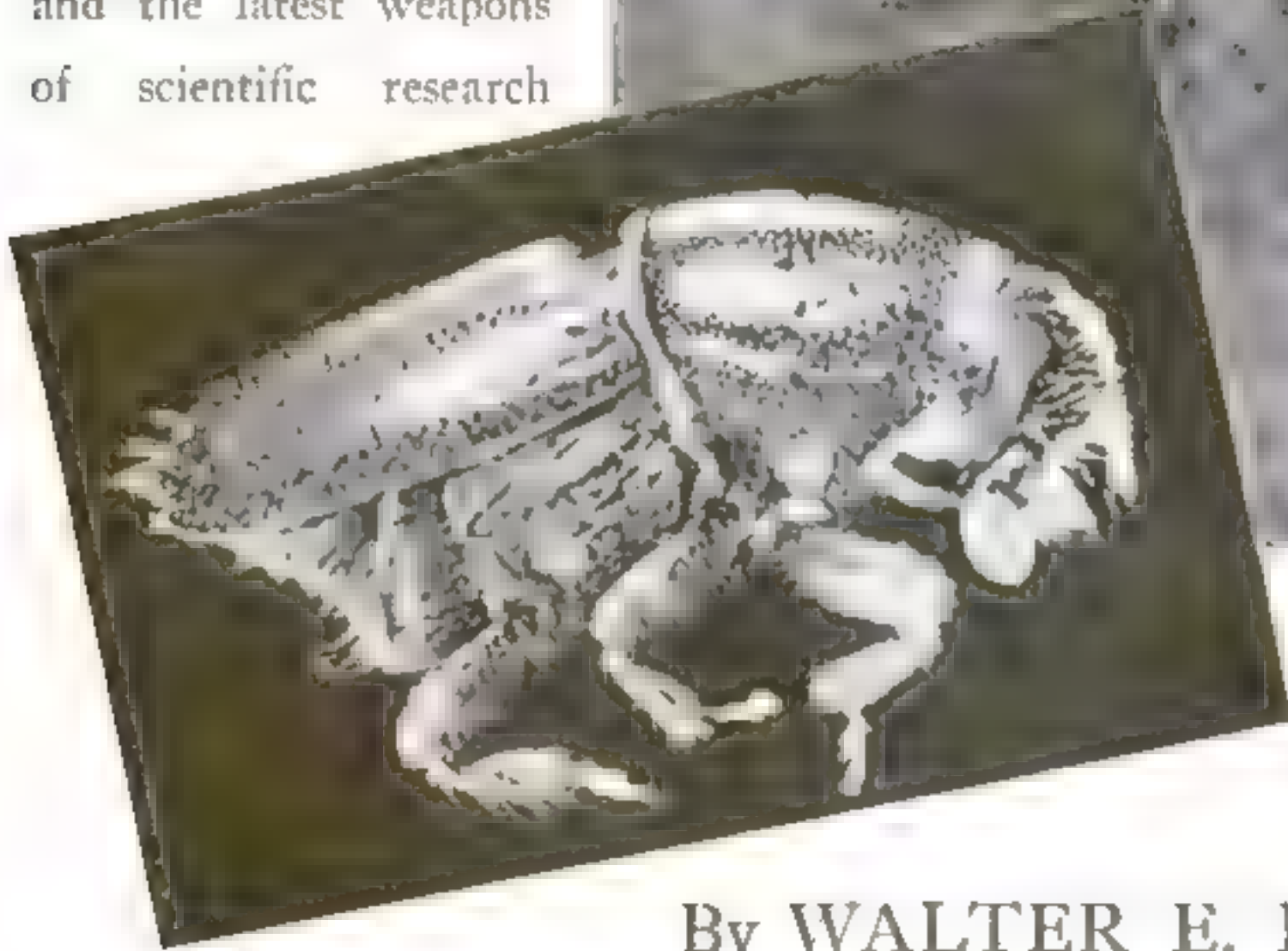
### NOVEL RATCHET HOIST PULLS OR LIFTS

DESIGNED for pulling or lifting in either a horizontal or a vertical direction, a new utility tool is useful for stretching cables, dragging heavy machinery, placing masonry, hoisting boilers, and numerous other heavy-duty tasks. Fitted with steel loading hooks at either end, the tool is operated with a ratchet lever. Although the model illustrated at the left weighs only forty-two pounds, it is said to be capable of lifting a three-ton weight a distance of fifty-four inches with its standard ten-foot, roller-type chain. The hoist is also available in other models, having capacities of three quarters, one and a half, and six tons.



# Army of Experts Wages War

In a desperate effort to save one of America's stateliest shade trees from a deadly plague, both state and Federal agencies are enlisting the aid of men, machines, and the latest weapons of scientific research



An autogiro scouting for diseased elms in heavily wooded country. Left, magnified view of a bark beetle, which carries the infection

By WALTER E. BURTON

**A**FTER more than two years of intensive fighting on several fronts, Uncle Sam finds himself with a fifty-fifty chance of winning one of the most important campaigns in recent years. On a battlefield covering almost 7,000 square miles, an army of experts is using autogiros, fleet scout cars, and special motorized equipment to stamp out an enemy that threatens to destroy America's stately elm trees.

In fighting the Dutch elm disease, as the dread tree plague is called, Department of Agriculture agents have had to combat a strange alliance between renegade insects and gangsterlike plants. For although the disease itself is caused by a fungus that grows within the tree, it is its insect henchmen that carry it about the country like an epidemic.

Its chief insect ally is the European bark beetle, a repulsive-looking creature no larger than a small ant. But what it lacks in size, it makes up in destructiveness, for this beetle is to the elm tree what the house fly is to man. Flying from tree to tree, it is the carrier of the dread disease that already has claimed hundreds of thousands of victims.

Living in elm trees, the tiny insect bores tunnels under the bark. As long as it confines its activities to a healthy tree, the beetle does relatively little damage. But if the tree is infested with the deadly fungus, the insect becomes a carrier of death. Spores of the fungus cling to its body as it works its way through the wood.

Then, when the beetle leaves that tree and flies to another, it carries with it the deadly infection. Boring into a healthy elm, the beetle brushes off some of the spores, which lodge in the tissues of the tree and start their fatal growth. Once planted, the fungus network soon chokes the life out of the tree.

The strange story of the rapid spread of Dutch elm disease goes back to 1919 when it was first identified in Holland. Thriving unchecked, it spread over Europe with such thoroughness and at such a rate that the elm population of that part of the world has long since been doomed. Only a miracle can restore to Europe its elms.

Discovery of a single diseased tree in the United States, some seven years ago, set experts of the Federal and state agriculture departments into action. A year later, several other ailing elms were found. Then, in 1932, not a single case turned up. But the next year, the epidemic broke out with new fury, and in succeeding years spread so rapidly that fears were felt for all the elms in America.

Careful and painstaking sleuthing by Government agents, detective work every bit as ingenious as any employed in tracking down a criminal, has since revealed definitely just how the deadly fungus entered this country. In checking over the various types of wood imported into the United States, experts found that over a period of years a large number of shipments of elm burl logs had been brought

in from Europe. These logs, because of their unusual grain pattern, were used in making veneer for furniture. Ships unloaded the logs at New York, Norfolk, Baltimore, and New Orleans. From these points, they traveled by rail to veneer plants in Ohio and other near-by states.

Ordinarily, such shipments of logs would arouse no more interest than so many loads of scrap iron. But it happened that some of these logs were the living quarters of hundreds of bark beetles. Even then, with the beetles alone, these logs would not have been particularly dangerous. It was the presence of the deadly fungus that converted them into agents of destruction. Escaping from the logs as they traveled on open railroad flat cars to the veneer factories, the disease-laden insects flew to near-by elm trees. Boring into the wood cells, they deposited the deadly spores in their new residences. In a short time, the destructive fungus had claimed new victims.

Today, the Government maintains a strict quarantine that prevents more diseased logs from entering this country. The eradication of the disease already present is enough of a task without permitting more to enter.

Theoretically, there are several ways in which the disease might be conquered. One would be to destroy the beetles that carry it. However, to capture and kill untold millions of fast-flying insects would not be an easy task, even if it were possible. Another method, equally difficult, would be to destroy the fungus itself. At the present time, Government plant experts are concentrating their efforts on eliminating the cause by destroying every tree that shows any signs of infection, as well as those that are sickly and weak and might become easy victims.

The facts and figures of the Dutch elm



# on Dutch Elm Disease

disease campaign being waged by the U. S. Department of Agriculture give the fight the aspects of a major military engagement. More than several million dollars have been appropriated for the work, and an army of skilled scouts, tree surgeons, and laboratory workers has been enlisted. Schools for recruits have been established, and large training camps have been set up in the affected areas.

The strategy of the Government forces consists first in finding dangerous trees. As in warfare, the enemy has to be located before it can be fought. And, again as in warfare, this scouting in the fight to save the elm is going on by air as well as by land. In cities and open country, trained scouting crews comb the parks and woods on foot and in cars, looking for the telltale wilting leaves and the characteristic black stains in the wood of the tree branches. In sections that are inaccessible, autogiros are brought into play. With these low-flying machines, scouts can hover over heavily wooded sections and tell whether or not the elms are suffering from disease or are so weakened by undernourishment, previous infection, or insect attacks, that they constitute a menace. When such trees are found, they are carefully located on a map, so that ground crews can go in later and destroy them.

At present, the main fight centers about New York City, one of the original points of entry of the disease into this country. More than three thousand scouts tour the states of New York, New Jersey, and Connecticut, while several hundred more are operating in suspected areas in Rhode Island, Ohio, Pennsylvania, Massachusetts, Illinois, Indiana, Virginia, Kentucky, Maryland, Tennessee, Mississippi, Georgia, Alabama, and Louisiana.

When a scout finds an elm tree that shows symptoms of being attacked by the destructive fungus, his first step is to subject the wood to strict laboratory tests. Samples of the wood, including that darkened as by fungus growth, are sent to the Department of Agriculture laboratory at Morristown, N. J. There a trained force

of expert pathologists makes cultures of organisms in the wood. The fungus causing the Dutch elm disease grows rapidly in potato-dextrose agar; so the pathologist puts small wedges of the suspected wood in culture dishes containing the agar. Accurate identification of the disease can be made in three or four days after the wood wedges are planted. Using special equipment, the Morristown laboratory can make 1,000 such cultures a day, if necessary.

Once a suspected tree has been definitely proved to harbor the disease, the eradication crews go into action. Along city streets and in residential sections, diseased trees are dismantled piecemeal by trained tree workers. In places where trees can be felled by cutting their trunks close to the ground, power machinery is used. Power-driven, endless-chain saws are employed to sever the trunks and cut the trunk and branches into short sections. All parts of diseased trees then are immediately destroyed by burning.

Power-driven machinery is used whenever possible: not only because it saves labor, but because it *(Continued on page 127)*

Above, a trained worker dismantling a diseased tree in a residential section. Branches are lowered to the ground with ropes. Lower left, an eradication crew cutting up a condemned tree for immediate burning



Cross section of an elm twig, showing the brown streaks produced in the young wood by the Dutch elm disease

Left, spores of Dutch elm disease fungus, magnified. These pearly white heads, on black stalks, appear in insect tunnels and in cracks in the bark of the infected trees





## BARKLESS DOGS BROUGHT FROM AFRICA



These four dogs are of an African breed recently brought to England. They are never known to bark.

MUTE but far from "dumb," four voiceless hunting dogs, the first of their breed ever to be seen in England, were exhibited at a recent international kennel show held in London. Short-haired and with sharply pointed ears, the curious animals have never been known to bark. The dogs are called "Basenjis," and were imported from Africa, where they are used for hunting by some of the remote tribes inhabiting the central part of the continent.



## NEW 100-WATT LAMP HAS 200-WATT EFFICIENCY

SHORTER and less than half as wide as a conventional 200-watt lamp, an experimental electric bulb just developed by General Electric Company engineers produces the same amount of light although it draws only 100 watts of current. Actually one bulb within another, the lamp employs two specially designed electrodes to produce an arc in the presence of mercury and a small amount of argon gas. When first switched on, the bulb emits a faint bluish glow which gradually builds up into a brilliant stream of light. The mercury bulb may be used in conjunction with filament lamps to produce a better quality of illumination.

## NOSE MASK REPLACES OXYGEN TENT

TO REPLACE cumbersome oxygen tents generally used for administering the gas, a Los Angeles, Calif., hospital has developed a new inhaling apparatus that fits over the patient's nose. Made of a transparent cellulose material, the inhalator is fastened around the nostrils and connected to the oxygen tank by thin rubber tubing. Besides reducing the gas consumption by about one third, the new device requires less supervision.



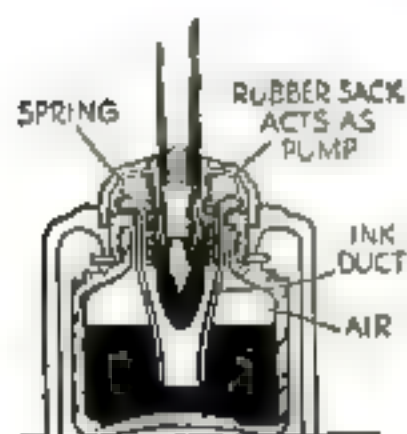
Patients breathing oxygen through new inhalator and, right, under tent

## ANTS HELP BUILD ROAD

HARD, gritty material manufactured by ants in building their underground homes is being used by highway engineers to surface a motor road now under construction in the French colonies in Africa. The supply is declared to be unlimited, for when part of the gritty substance is removed from the giant ant hills that dot the route, the ants promptly replace it.

## SLOT MACHINE SELLS WORMS FOR BAIT

FISHING BAIT is sold by a homemade slot machine recently constructed by Herman Douyard, a Northampton, Mass., bait vendor. When a customer deposits a quarter in a slot and turns the handle, an "elevator" descends to a storage chute and a lever shoves on a can of worms. The worm hoist then ascends the shaft and a second lever pushes the can out of the machine onto the ground. A sign on the top of the automatic bait vendor indicates to customers whether the storage chute is full or empty.



How a fountain pen is filled automatically by dipping it into the inkwell. Photograph at right shows device in use



## FOUNTAIN PENS FILLED BY AUTOMATIC INKWELL

FOUNTAIN PENS of the sack or vacuum type are filled automatically merely by dipping them in an inkwell unit just marketed. Downward pressure of the pen on an ink-filled rubber sack forces the ink up into the pen reservoir. Removal of the pen creates a vacuum to refill the sack from a glass well.



When a coin is inserted and a handle turned, this homemade machine delivers the bait



## STOCKING RUNS MENDED WHILE CUSTOMERS WAIT

A CURBSIDE repair station for women's stockings is the odd business conducted by an English girl. Setting up her kit on a busy street, she mends runs and rips while customers wait. The charge is "tuppence per ladder"—meaning about four cents for each stocking run.



A curbside "first-aid" station for stockings



Girl art students at Temple University molding bronze ingots for casting statues

## STUDENTS RUN FOUNDRY TO CAST METAL STATUES

INSTALLATION of a new foundry at the Temple University School of Art, Elkins Park, Pa., enables students to cast their clay models in metal instead of sending them out to commercial foundries. Under the direction of Boris Blai, well-known sculptor, young art students, clad in fireproof pants and protective goggles, operate a furnace, pour molten metal, and carry on all other steps necessary to pro-

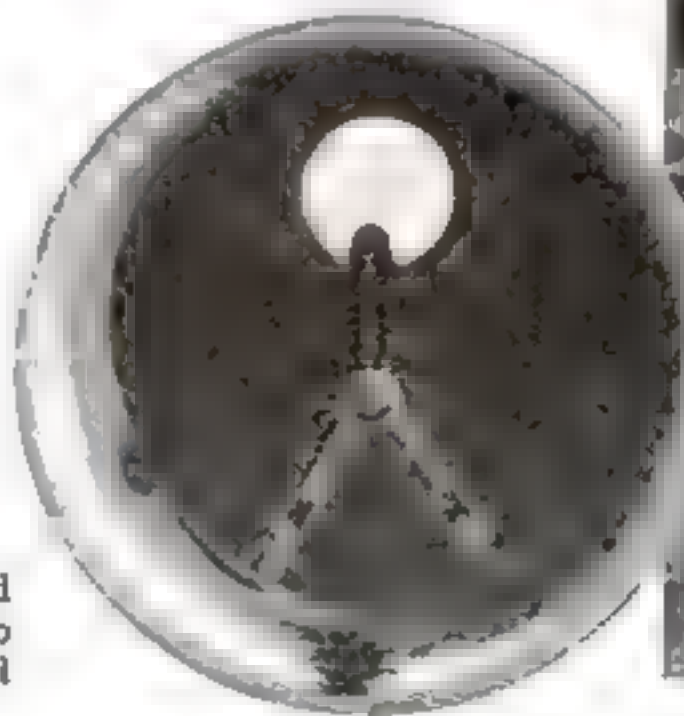


Another student chipping the plaster mold from a finished cast

duce a finished metal cast. Assaying and the preparation of casting alloys also are studied in the novel foundry, where more than 100 girls now are learning the art of casting in metal.

## PIPES ARE COATED WITH ASPHALT IN NEW RUSTPROOFING PROCESS

RUSTPROOF pipe is now being produced by a new process that employs a series of ingenious mechanical devices. Steel plates are rolled to form the pipe, electrically welded at the seams, and then cleaned with wire brushes and solvents. A spray nozzle mounted on wheels first travels through the pipe to apply a bonding material. Narrow troughs are then inserted and tipped to pour out asphalt enamel while the pipe itself is rotated to insure a uniform coating. Finally, hot asphalt enamel is applied to the exterior, and felt is wound around the pipe by a lathe-type wrapping machine specially built for the purpose.



Right, a spray nozzle placed inside a section of pipe to apply the bonding material



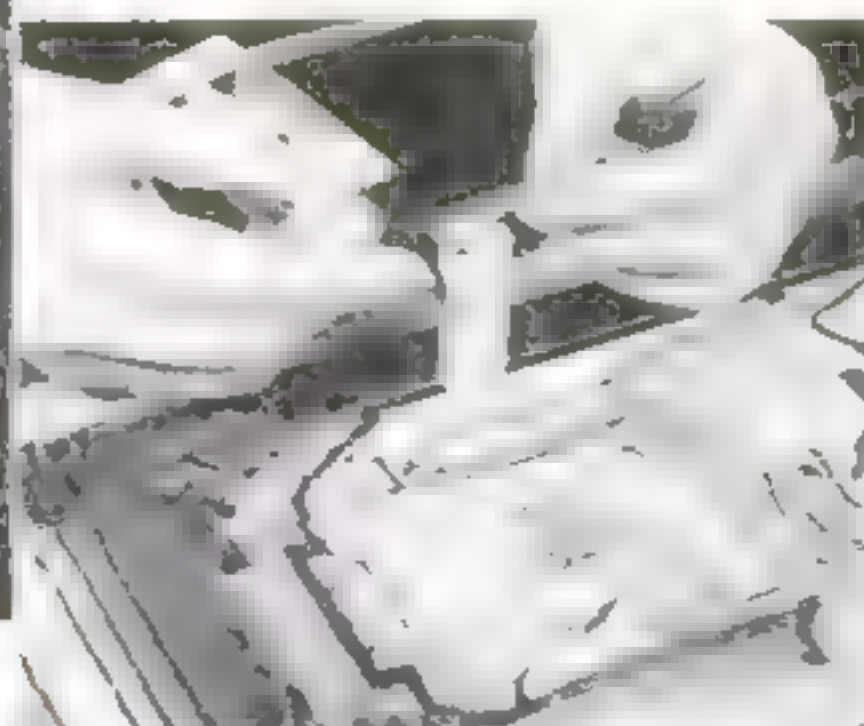
Asphalt enamel is poured evenly from this trough as the pipe is rotated around it



Players tackling a baffling "murder mystery" in a new game which is said to present an entirely new crime and its solution every time it is played

## NOVEL GAME PLOTS MURDER MYSTERY

PLAYED on a board showing the floor plan of a house, a new game just placed on the market develops the crime, plot, and solution of a murder mystery as the players move pawns about the board. Seven separate characters are represented by the hollow pawns, which conceal the suspected murder "weapon"—either a dagger, revolver, ax, or bottle of poison. An ingenious feature of the game is that it is said to provide a different solution of the "murder" each time it is played.



Characters are represented by hollow pawns that conceal suspected "murder weapons" inside them



## FASHION SHOW TESTS TELEVISION SYSTEM

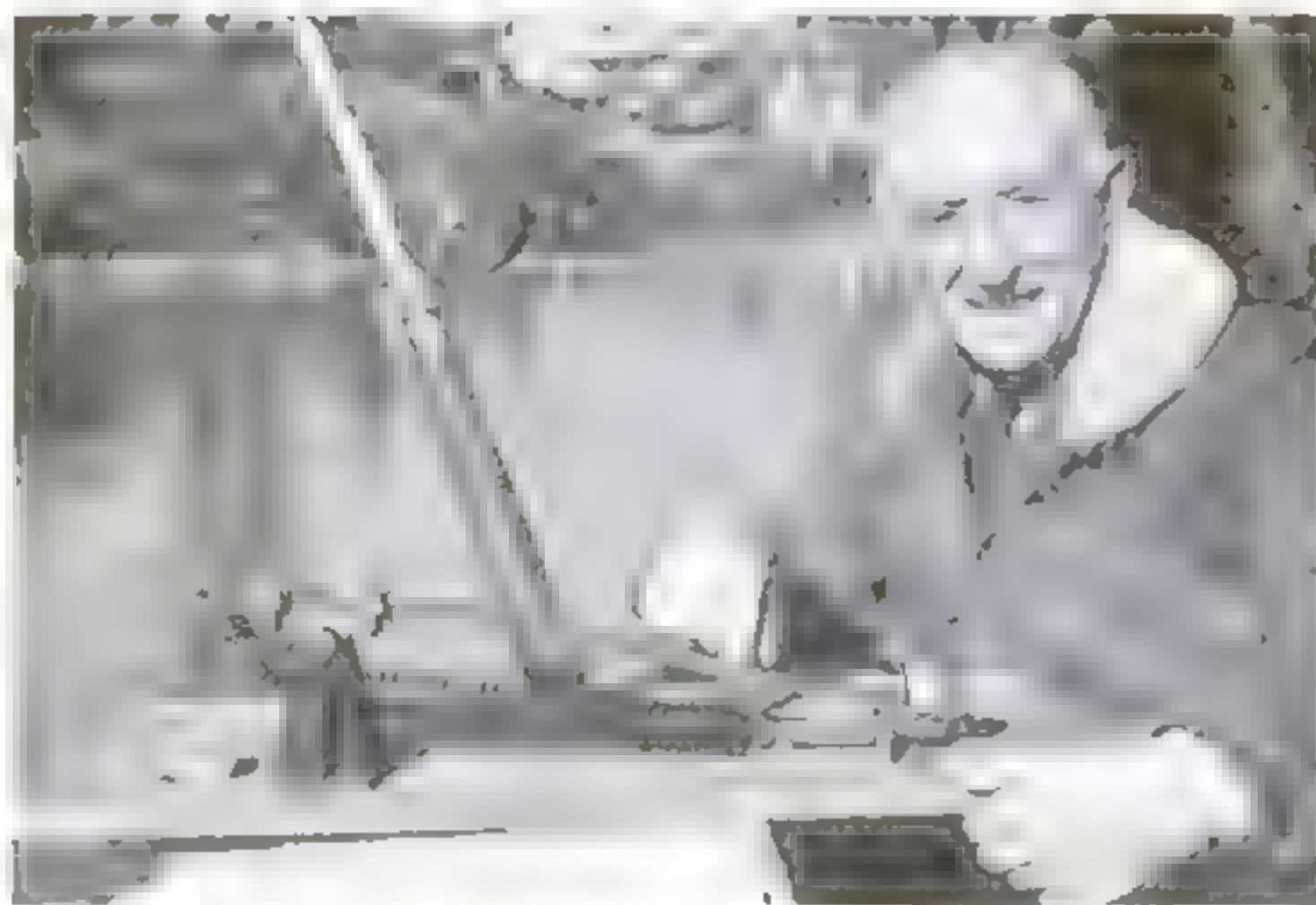


A model displaying a new bathing-suit design in a novel television fashion show. At the left is shown the "eye" of the new television system, which is said to produce very clear images

A FASHION SHOW of new gowns, capes, hats, and bathing suits formed a feature of a recent television demonstration broadcast from a Philadelphia, Pa., studio to illustrate advances in television technique. Using new and improved apparatus, engineers demonstrated how such small objects as second hands on watches and serial numbers on dollar bills could be seen on the receiving screen. Latest equipment employs 441 scanning lines to each picture, whereas the highest number previously used was 345, an increase said to improve the clarity of the pictures.

## SPRING CATAPULT CASTS FISHING LINE

FISHING LINES are cast accurately by a mechanical device invented by a California angler. The sinker attached to a line is placed in the spoon-shaped end of a metal arm. When a trigger is released, a strong coil spring snaps the arm upward and hurls the line out into the water. The inventor claims that casts as long as 300 feet from either shore or boat are possible with the use of his novel catapult apparatus.



Pulling a trigger releases spring arm that hurls the sinker 300 feet

## "SUMMER SKIER" JUMPS INTO WATER

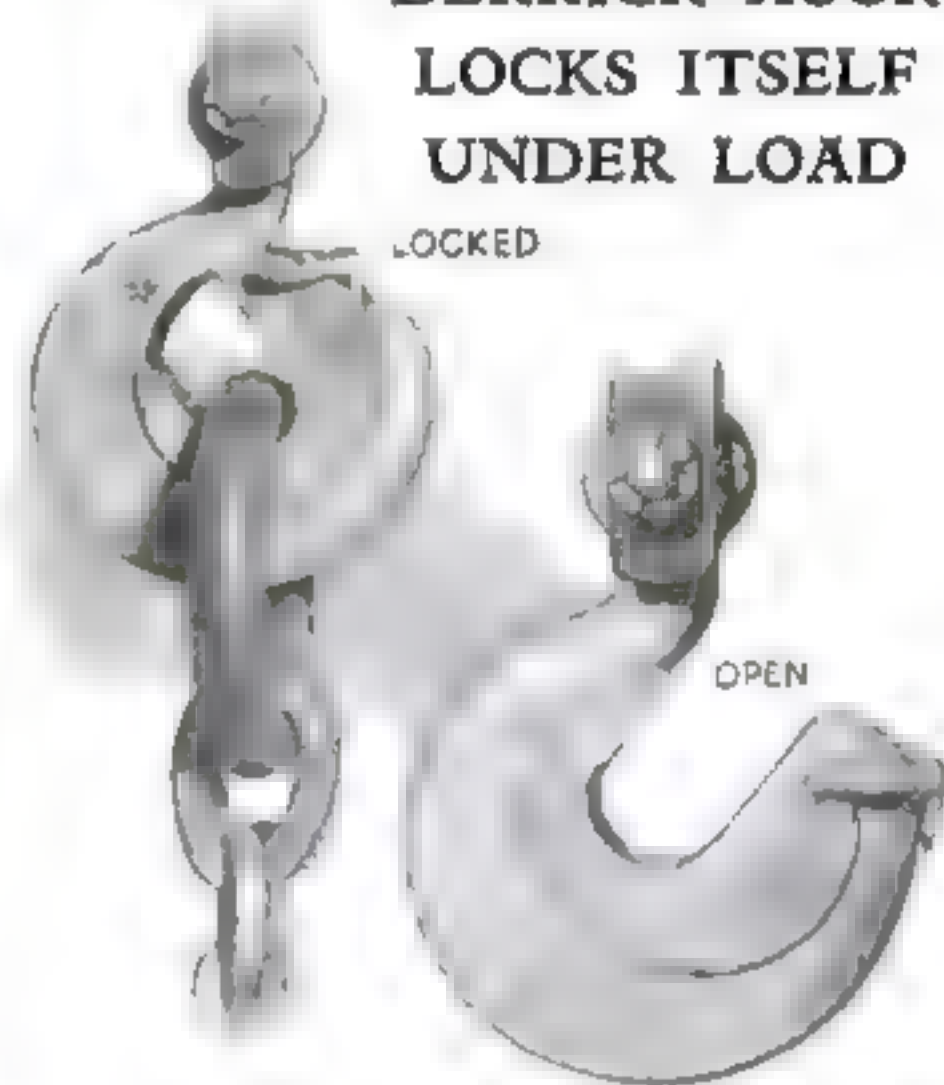
SKI-JUMPING into water is a novel stunt recently demonstrated at a Florida resort. Clad in a bathing suit, the jumper races down an ice-covered slide and leaps from

a platform into a swimming pool. Flipping a heel clamp releases the skis after the jumper has landed in the water, to enable him to swim back to shore.



A skier striking the water of a swimming pool after sliding down an incline that is coated with ice

## DERRICK HOOK LOCKS ITSELF UNDER LOAD



A NEW loading hook for use with cranes, hoists, and other lifting machinery locks itself automatically whenever a strain is placed on it. When a chain link is looped onto the hook, as pictured above, an off-center, flanged cam turns to the closed position as soon as the load is applied.

## NOVEL ROTARY SHEARS CLIP HAIRS ON FACE



The lever mechanism rotates an inner cylinder to clip hairs

ROTARY facial shears just marketed make it easy to clip growths of hair from the nose, ears, or eyebrows. Squeezing a lever mechanism rotates an inner cutting cylinder to clip off hair close to the skin. The device will not cut the skin, it is claimed.



# The Man



with the Net

**TWENTY MILLION** meteors a day strike the earth's atmosphere.

**DINING-CAR** patrons on railroads in the United States eat 15,000,000 pounds of meat a year.

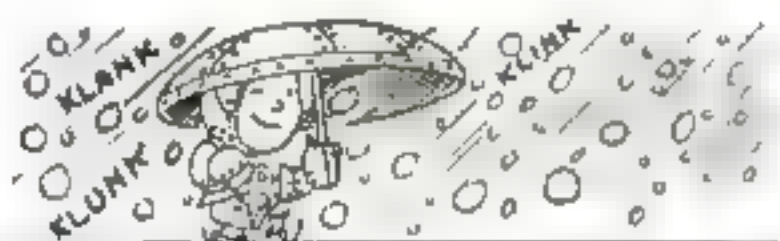
**EIGHT-FOOT** sharks can swallow whole three-foot sharks.



**RUBBER BARBS** are used on wire entanglements in Hollywood war scenes to protect the actors.

**RAILROADS** in the United States schedule 644 passenger runs which maintain an average speed of sixty miles an hour from terminal to terminal.

**HAILSTONES** cause a world-wide damage of \$200,000,000 a year.



**ROSE PETALS** and pine needles are used in Russia as a source of the scurvy-preventing vitamin C.

**COWS** drink an average of 1,500 gallons of water apiece during the five warmest months of the year.



**SPURS** on the middle legs of bees enable them to pry out the pollen, which they then pack in little pollen baskets on their hind legs.

**BINOCULARS** for viewing the scenery are provided for passengers on luxury airliners flying between New York and California.

**BUTTERFLY** antennae are a hundred times more sensitive to certain smells than the nose of a bloodhound.



## NINE-YEAR CAR TRIP LINKS AMERICAS

STRUGGLING through uncharted jungles, swamps, and mountain ranges, three Brazilian engineers have just completed a nine-year, 15,000-mile automobile journey to blaze the trail for a projected road linking North and South America. Said to be the first to make the trip between the two continents by automobile, the adventurers are shown in the photograph at the right indicating their route on a map as they stand in front of their two travel-worn motor cars.



These three men drove automobiles from Brazil to the United States



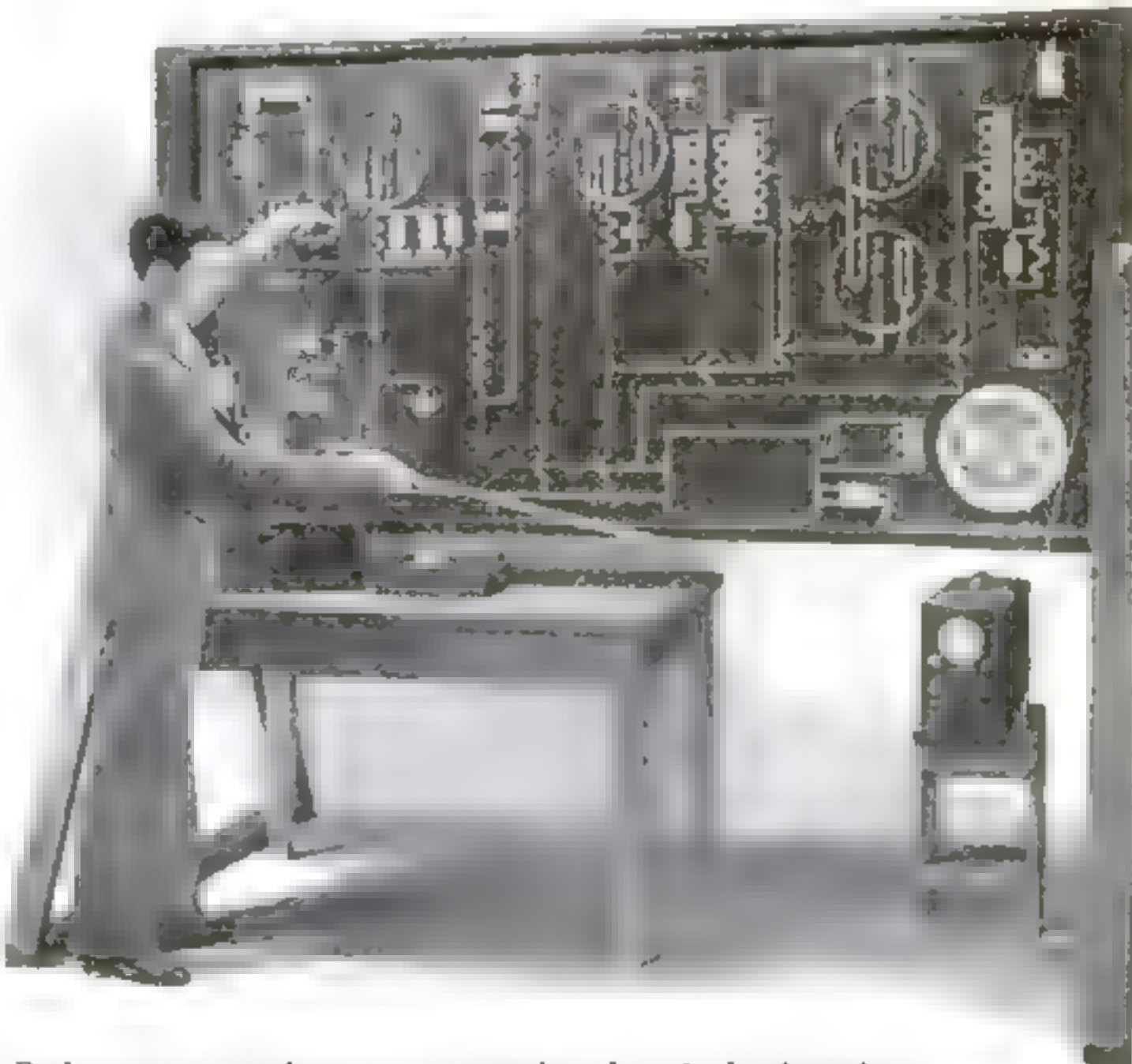
### NEW PUSH-BUTTON TUNER FOR AUTOMOBILE RADIOS

PUSH-BUTTON tuning of automobile radios is made possible with a new device that clamps to the steering post of the car. Five buttons are provided, and each may be adjusted to a different radio station. Besides offering convenience, it is pointed out, the tuning buttons make driving safer, because they offer less distraction to the driver than the conventional dial, which they supplement.

### GAS MASK FOR INVALIDS RESEMBLES A HELMET

DESIGNED for the use of invalids, hospital patients, and others who cannot wear the ordinary type, a new gas mask manufactured in Czechoslovakia is made in the shape of a helmet with a flexible tube leading to a hand-operated air pump. The user can move around freely without discomfort. An automatic pump also is available.

Special gas mask designed to give freedom of movement to invalids



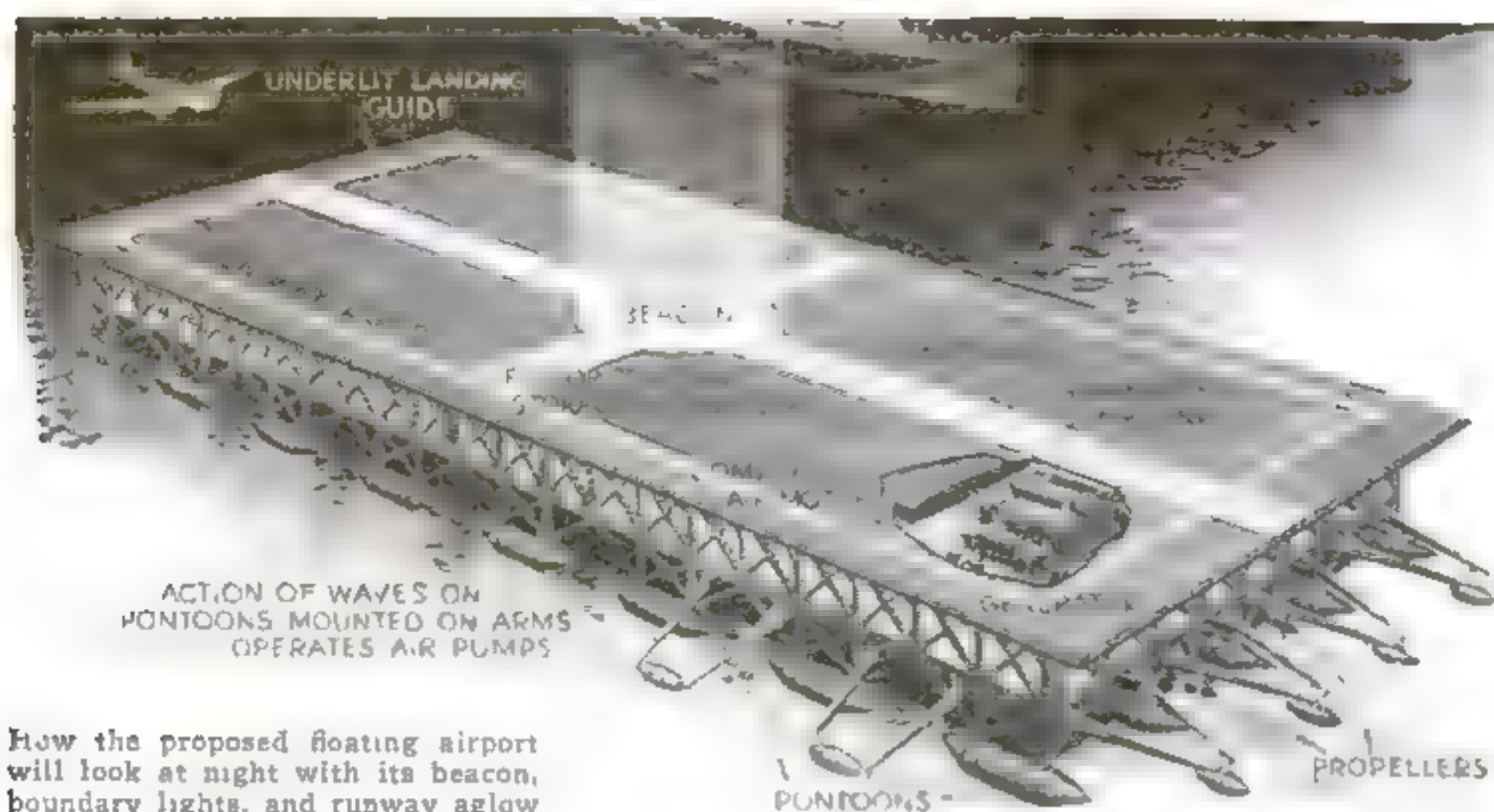
Radio circuit conditions are reproduced in the loudspeaker

### TEACH RADIO SERVICE MEN TO LISTEN FOR TROUBLE

RADIO troubleshooting is taught through both the eye and the ear in a new system for training service men. Various circuits are illustrated by large schematic diagrams on a board, behind which are mounted the pieces of apparatus represented. By throwing switches located on the corresponding parts of the board, the instructor can produce in a loudspeaker the audible effects of the conditions he describes.



## FLOATING OCEAN AIRPORT GETS POWER FROM WAVES



How the proposed floating airport will look at night with its beacon, boundary lights, and runway aglow

A FLOATING landing field for trans-oceanic planes, just designed by a French inventor, utilizes wave-operated outrigger floats to generate power for its lights and propelling machinery. Operating through a system of levers, the floats drive large air compressors. The air is then used to run a dynamo for electricity and to drive the propellers which will keep the marine airport stationary against the action of strong winds and currents. Translucent runways, lighted from below, will be visible to pilots at great distances.

## TINY MODEL LOCOMOTIVE IS BUILT LIKE A WATCH



So TINY that it had to be assembled with the aid of a jeweler's magnifying lens, a miniature locomotive built by a California model maker is less than five inches long. Patterned after a switching engine, the twenty-four-ounce model is powered by a six-volt motor of the automatic-reversing type. All parts of the diminutive locomotive were machined on a jeweler's lathe.

## DEVICE "PAGES" WORKERS FOR PHONE



When a dial is set and the plunger pressed, a signal is given out

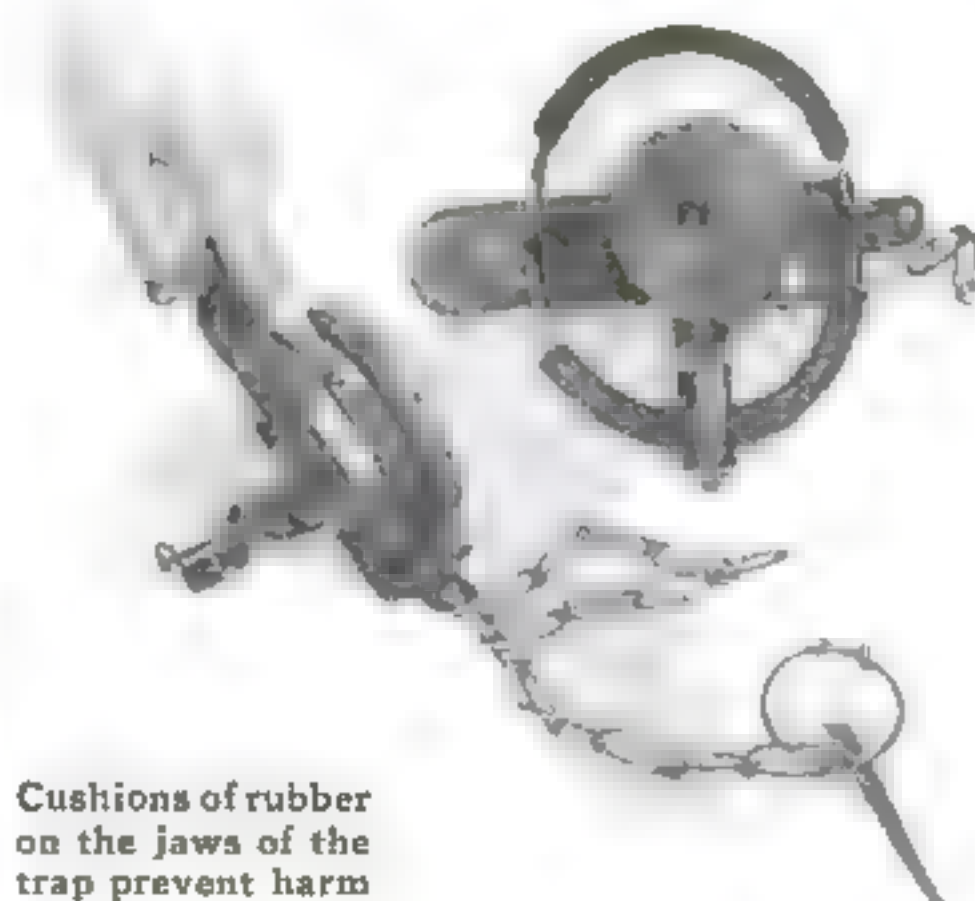
EXECUTIVES and office workers can now be summoned to their telephones to answer important calls by an automatic, electric paging device. When a ring is not answered, the switchboard operator sets a dial and presses a plunger. A visual or sound signal in a prearranged code then warns the individual that a call is waiting. The robot signaller can be used for general signals to all the employees, if desired.

## TREE CAVITIES FILLED WITH RUBBER

TREE SURGEONS are now halting the decay of stately old elms and oaks by filling their rotted cavities with rubber. Specially compounded to withstand long exposure to the sun and extreme changes in temperature, the rubber is applied in long strips cut to fit the contour of the opening and built up from the bottom like a brick wall. As the cavity wall rises, the space back of it is filled with a cement mixture designed to absorb all moisture and to resist shrinking. Flexibility of the rubber patch enables it to twist with the swaying tree without cracking, and permits natural growth of new bark over the filled area.



A cavity partly filled with rubber. Right, workers applying cement

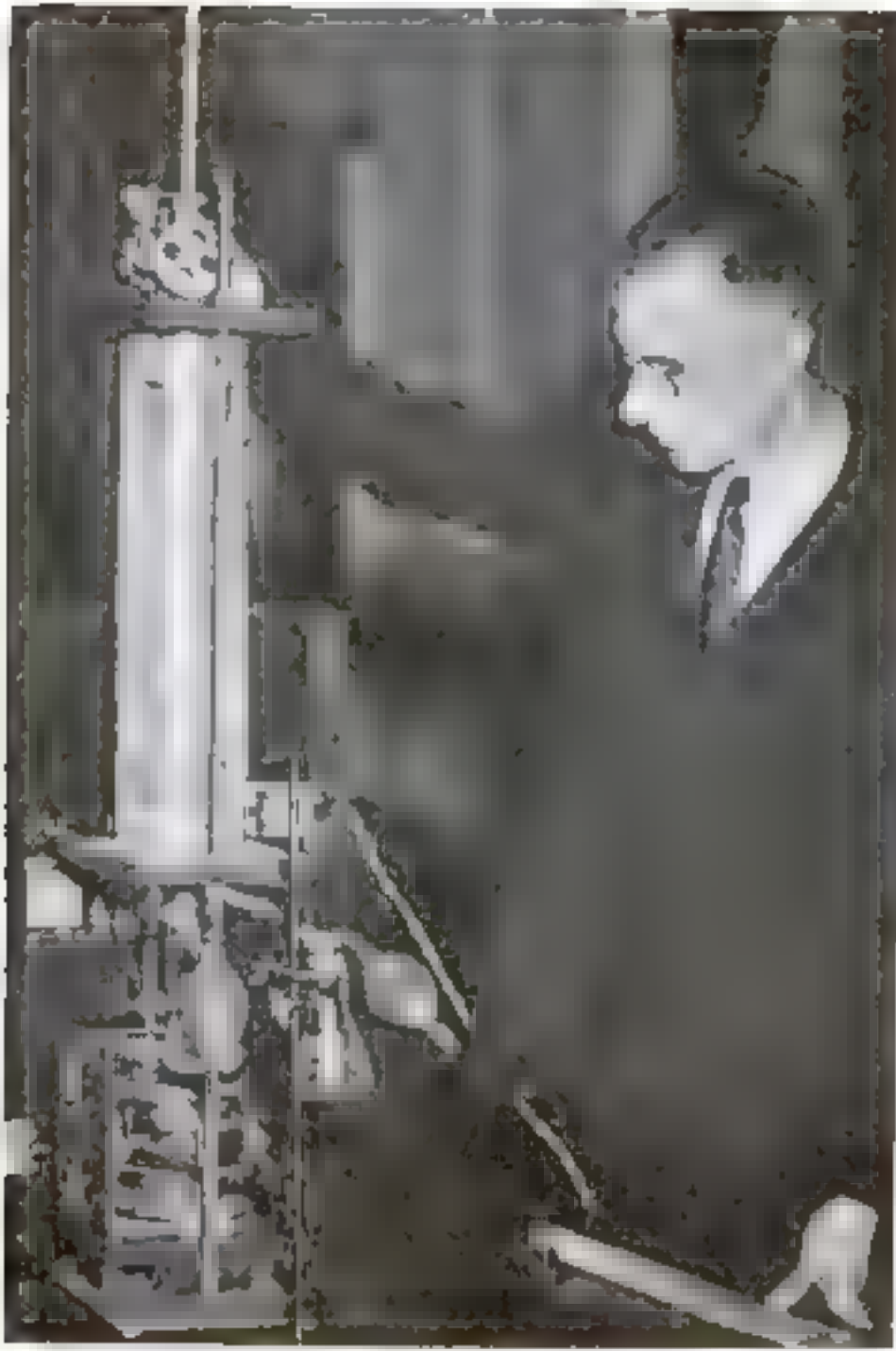


Cushions of rubber on the jaws of the trap prevent harm

## HUMANE ANIMAL TRAP HAS CUSHIONED JAWS

ITS steel jaws incased in cushions of resilient rubber, a new humane animal trap has just been perfected by a Chesapeake Bay trapper. A strong steel spring insures a powerful grip, but the rubber-sheathed jaws will not crush an animal's leg nor damage its fur.





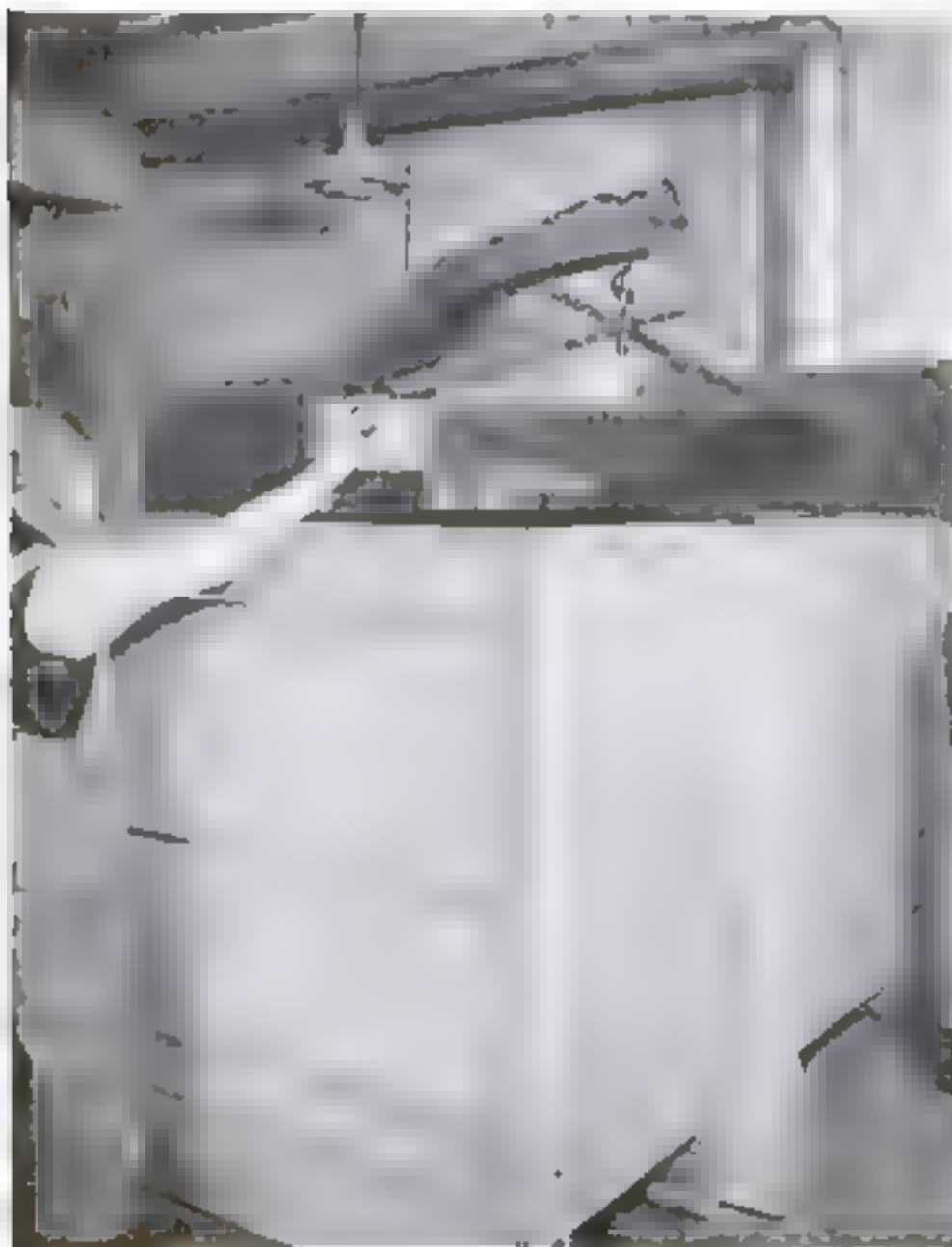
### SMOKE AND FOG REMOVER USES SOUND VIBRATIONS

HIGH-FREQUENCY sound vibrations are employed for dispelling smoke and fog in a new apparatus developed by the U. S. Bureau of Mines. In the demonstration model shown above, smoke is pumped into a glass cylinder. When the sound waves are directed at the column, the tiny particles composing the smoke are precipitated to the bottom. It is believed that the apparatus also would dispel fog, which is water vapor formed around dust particles.

### ALUMINUM FOIL COVERS LOCOMOTIVE BOILER

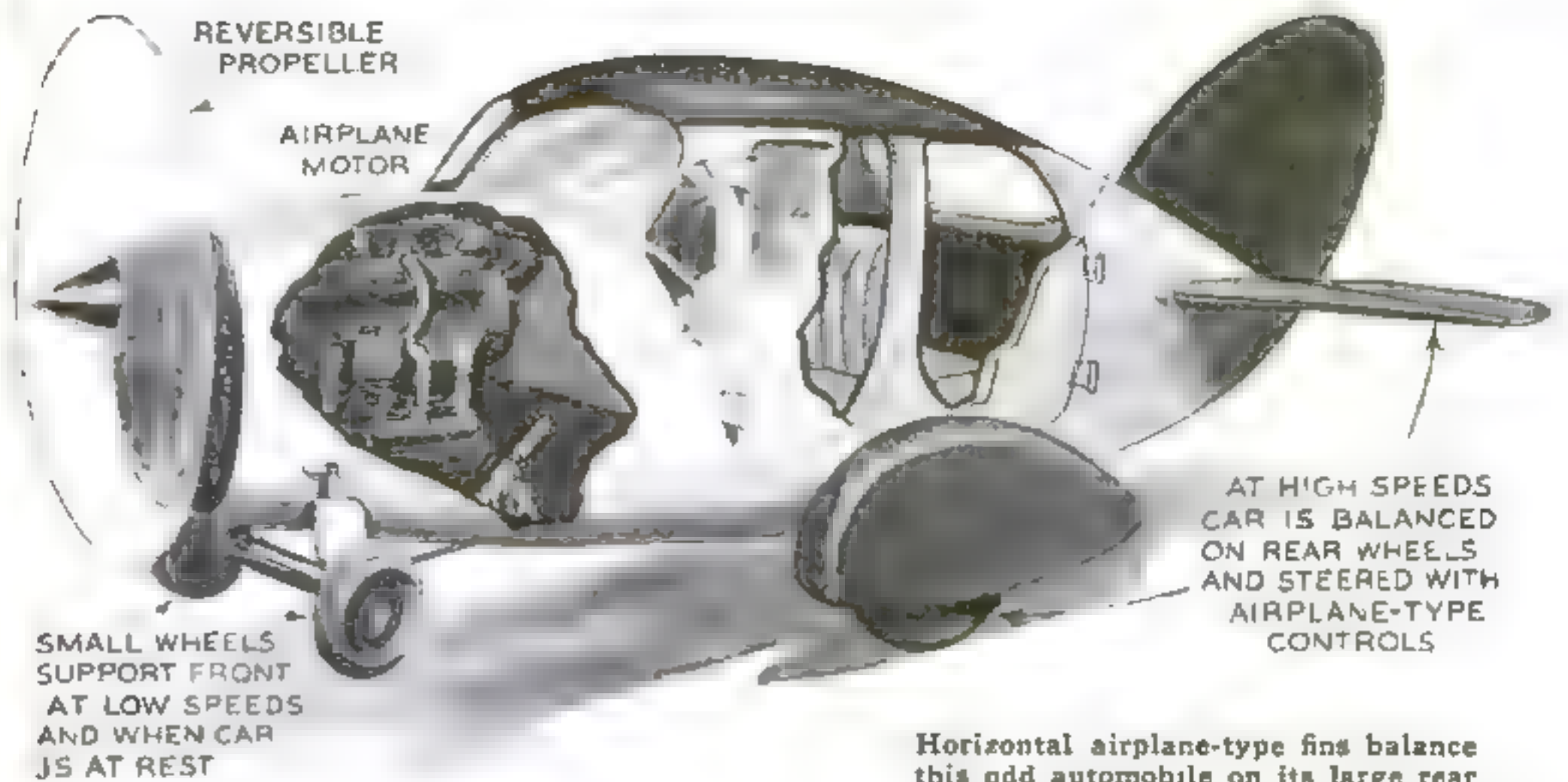
CRUMPLED sheets of aluminum foil are used for lagging, or heat insulation, around the boiler of a new type of steam locomotive. The novel material is packed in wire "baskets" or forms shaped to conform to the surface it is to cover.

### SALT BATH SPEEDS SEASONING OF WOOD



Placing wood in salt bath. Right, samples from same plank; the upper piece was dried with salt

### "KANGAROO CAR" RUNS ON REAR WHEELS



Horizontal airplane-type fins balance this odd automobile on its large rear wheels at ordinary speeds. The front wheels are used when running slowly.

**S**PEEDING along highways on two wheels, its front end clear of the ground, a novel automobile just designed is driven by a reversible propeller geared to an airplane motor. Operated by auto-

mobile-type controls, the streamline car is balanced by rear-end stabilizers and steered by a rudder at high speeds, or by its small front wheels when starting or running slowly.

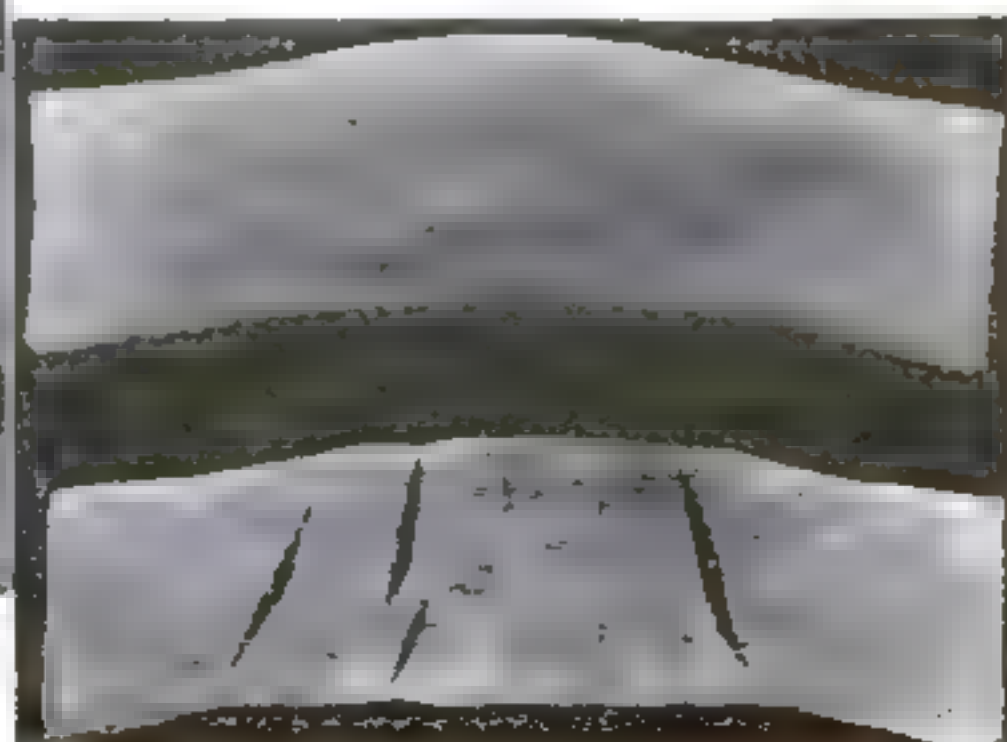
### TUNES RADIO AND TELEVISION SETS

RADIO and television sets are tuned simultaneously by an ingenious synchronizing apparatus just developed in anticipation of widespread commercial production of television receivers. So that existing radio sets can be utilized to receive the sound while new television receivers are employed for the broadcast images, the device is said to control both receivers with a single operation that tunes them with hairbreadth accuracy. The inventor is shown explaining the unit's operation to Boris Karloff, film star.



This device tunes radio and television receivers simultaneously

SEASONING lumber with salt, a process developed recently by the U. S. Forest Products Laboratory, Madison, Wis., may make it possible to use woods now unsuited for building because they develop cracks under present seasoning methods. Green lumber is first immersed in a saline solution. When the salt has just penetrated the surface, the wood is then placed in a drying kiln, where the salt draws interior moisture to the surface.

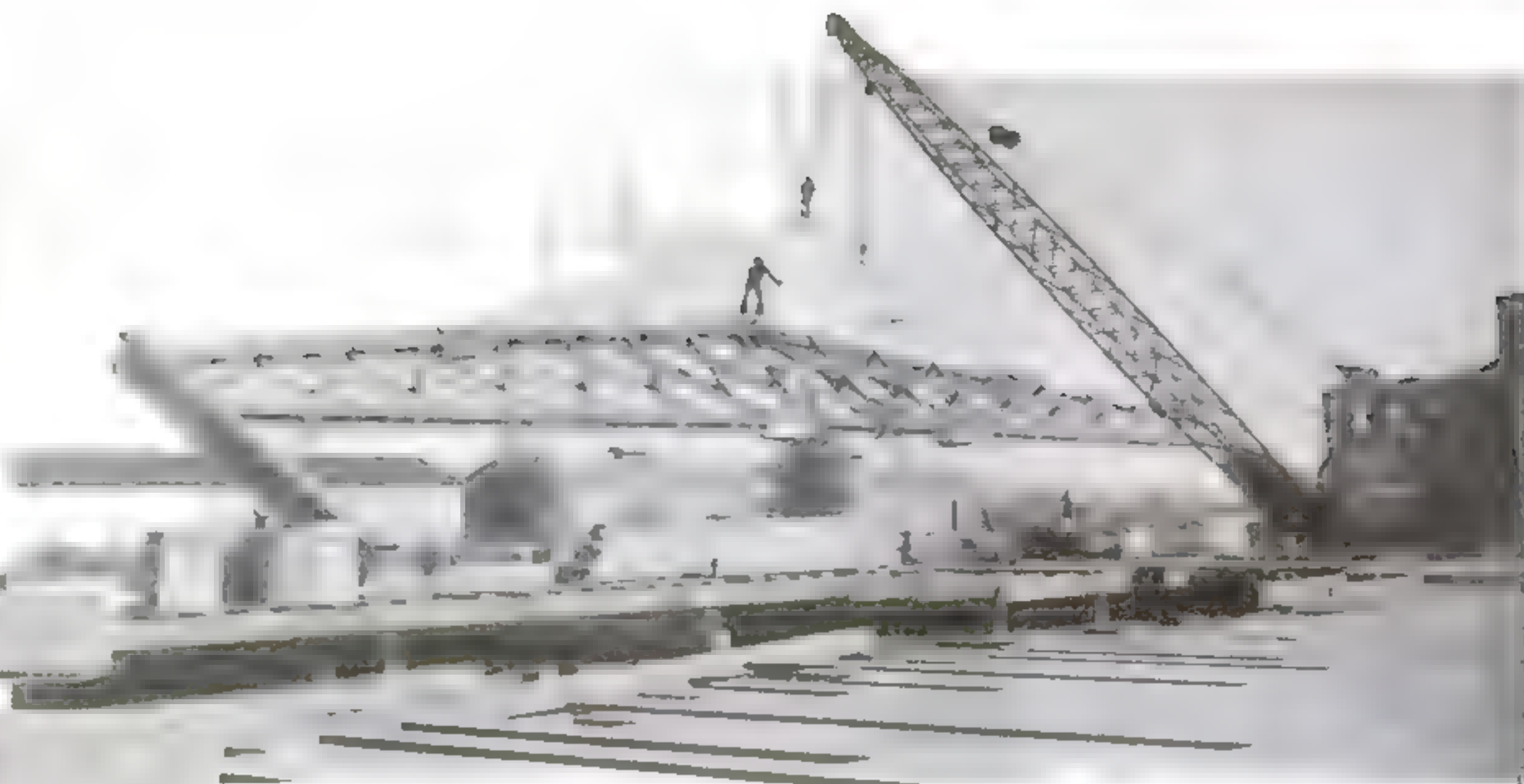


### SWEET POTATO WEIGHS TWENTY-THREE POUNDS

WEIGHING almost half as much as a whole bushel of ordinary "spuds," a giant twenty-three-pound sweet potato grown in Florida is said to be the largest ever measured by the U. S. Department of Agriculture. The titanic tuber is thirty-one inches long and measures sixteen inches around the middle.



At the right, a wooden truss of 113-foot span, built with timber connectors, being raised after assembly. Below, how toothed rings are squeezed into wood to produce a strong joint



# Magic Timber Joint

*Opens New Era in Building With Wood*

WOODEN radio towers, bridges, scaffolding, and building frames that have the strength and lightness of steel now are being erected with the aid of ingenious metal rings recently introduced to American builders by the U. S. Department of Commerce. Called "timber connectors," these new building aids are designed to give greater strength to joints of wood by increasing the bearing area over which load is distributed.

The two types of connectors most commonly used are illustrated below. One is a plain met-

al ring with a tongued split at one point, and is sunk in grooves cut around the bolt holes in the pieces to be joined. The other is a toothed, corrugated ring which is forced into the wood by turning ball-bearing nuts on special bolts before the regular bolts are inserted. In either case, the result is a joint that is several times stronger than a conventional fastening.

Tests have shown that joints formed with timber connectors often are actually stronger than the pieces they unite! Since wood columns, tension members, and other parts used in construction are approximately as strong as steel on a pound-for-pound basis, the new joining method opens vast possibilities in building with wood.

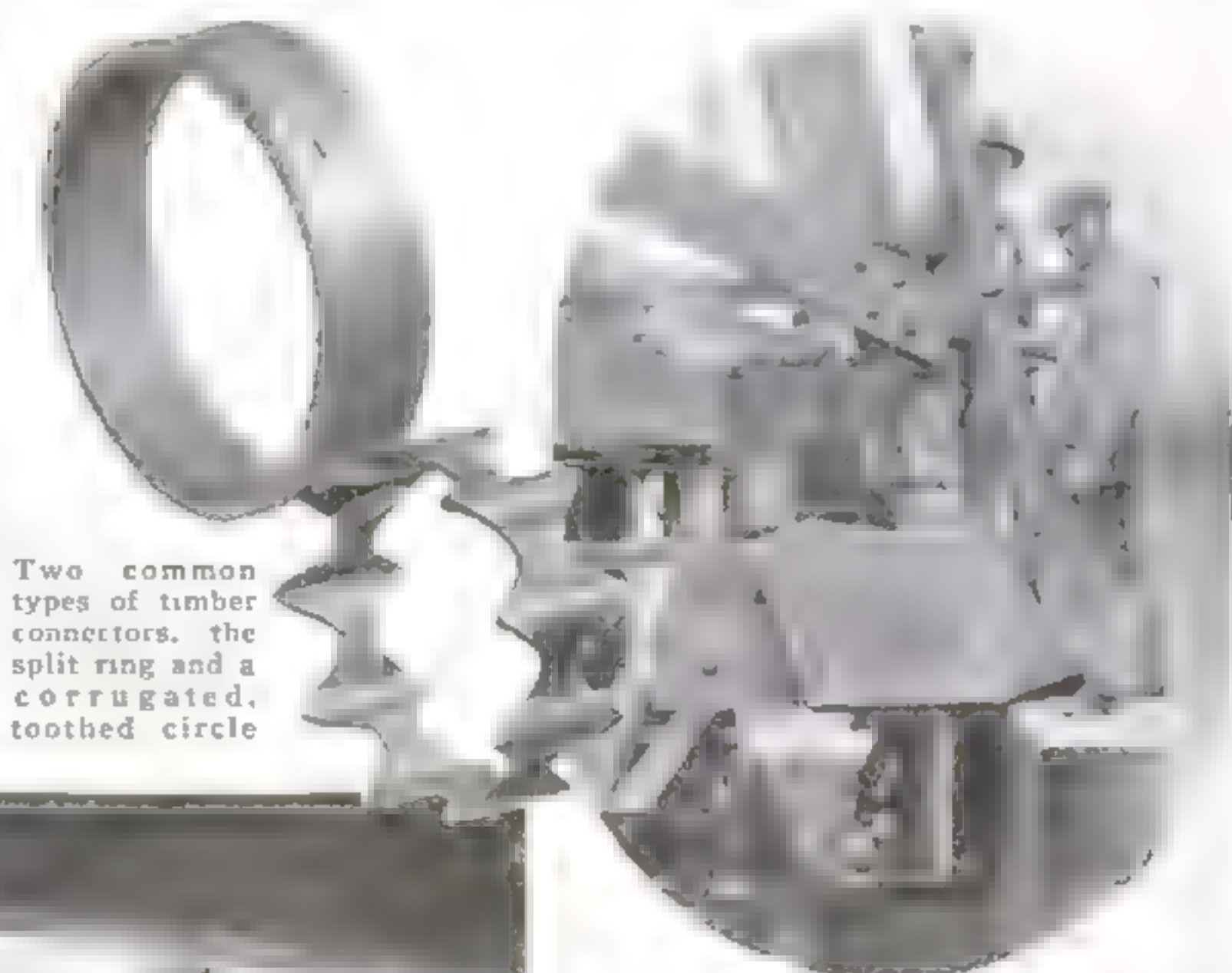


1 For joining timbers with a split-ring connector, bolt holes are bored in both members midway between edges

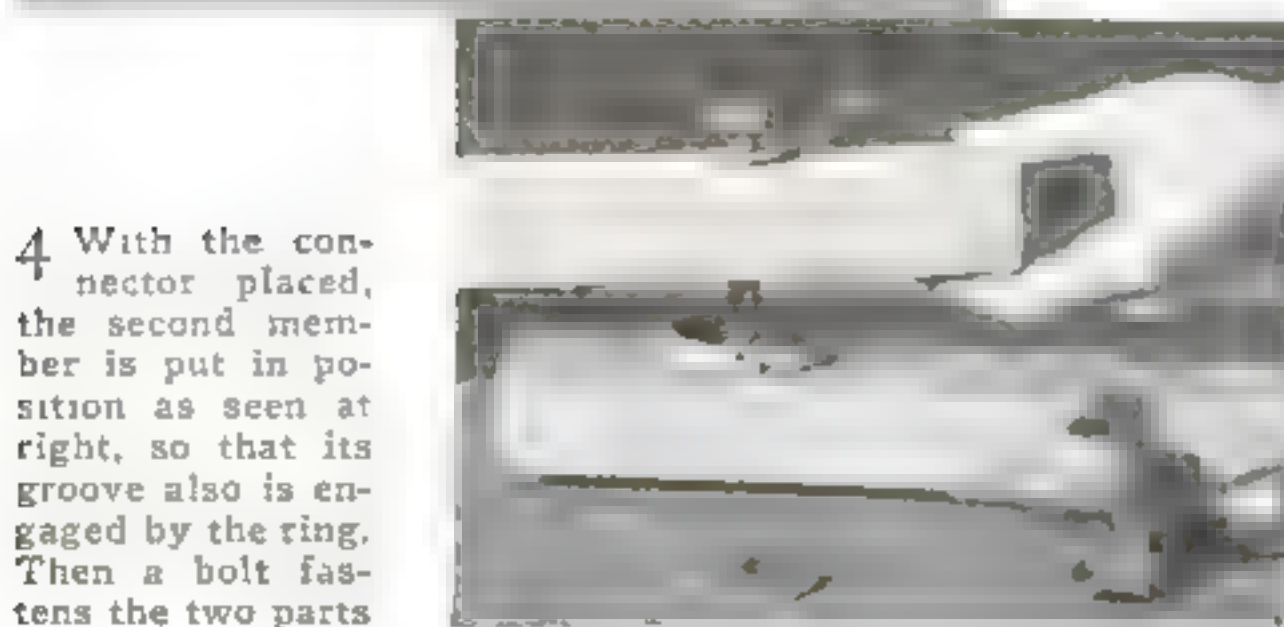
2 A special cutting tool attached to a brace or drill cuts a circular groove around the hole on each inner surface



3 The ring is spread and inserted in the groove on one of the boards. The spreading allows for shrinkage of the wood and insures a good fit



Two common types of timber connectors, the split ring and a corrugated, toothed circle



4 With the connector placed, the second member is put in position as seen at right, so that its groove also is engaged by the ring. Then a bolt fastens the two parts

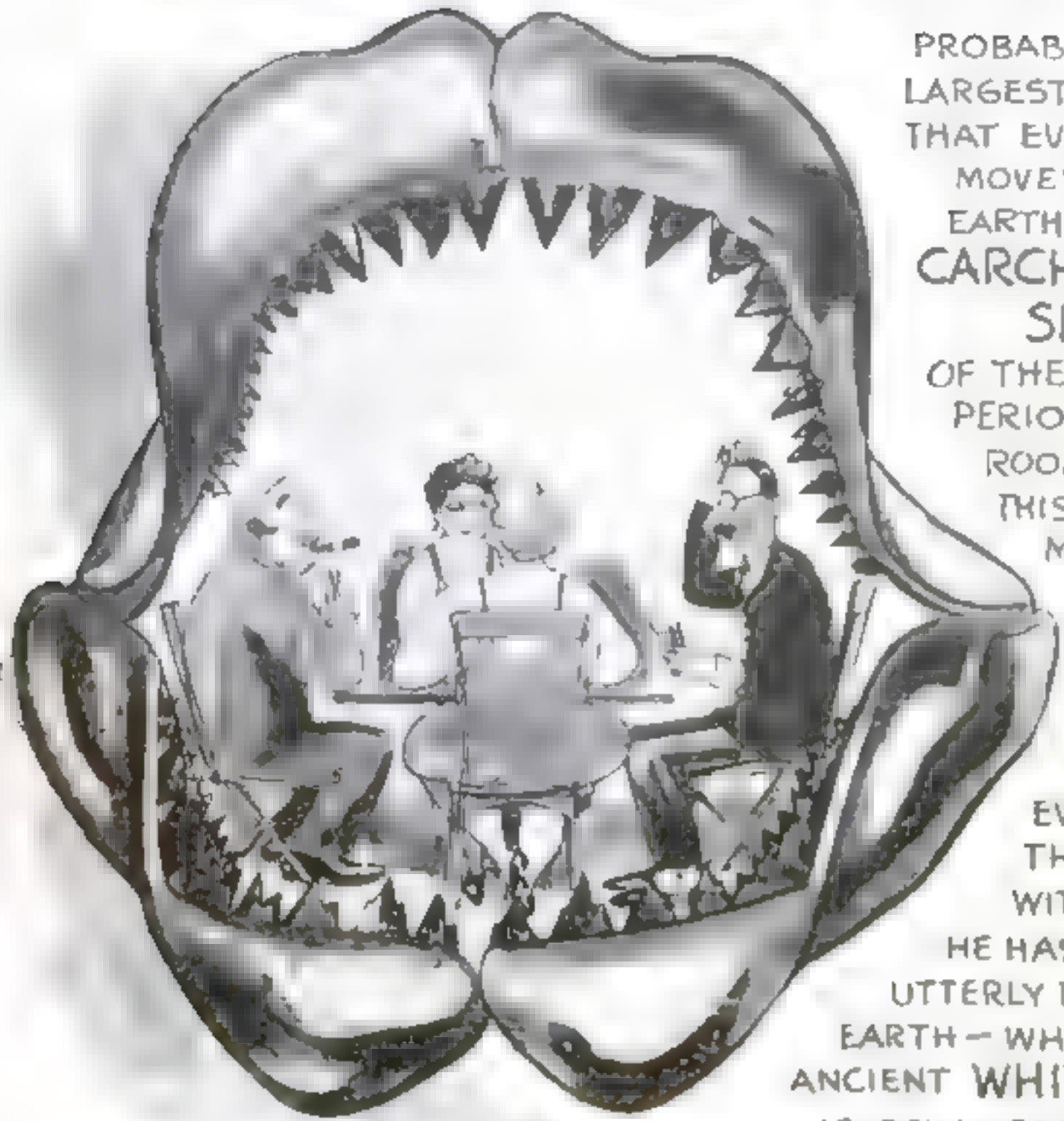


5 Tightening up the bolt draws the two pieces of wood together

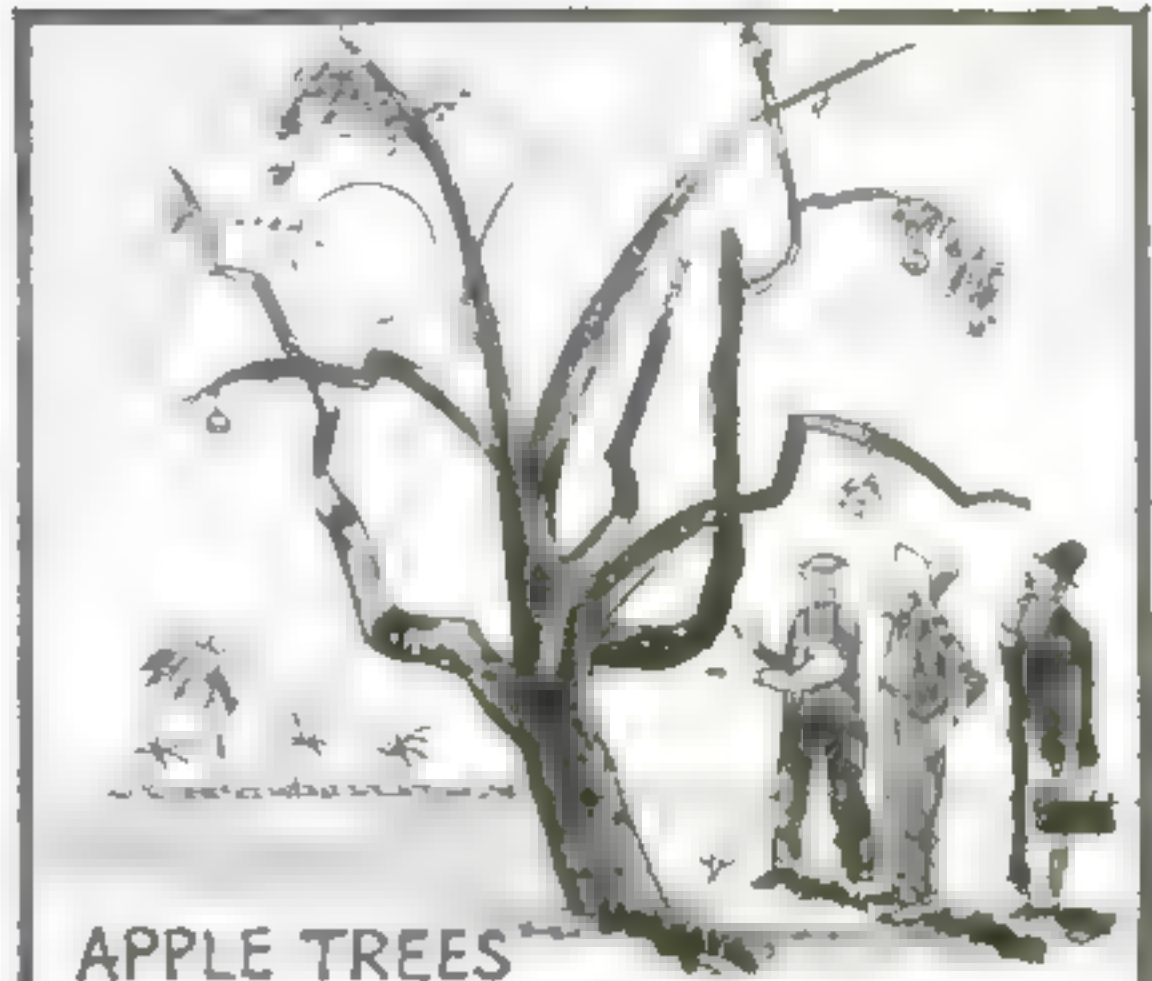
In the unusual piece of construction seen above, plywood was used for a gusset plate and held in place by timber connectors



# Un-Natural History By GUS MAGER



PROBABLY THE LARGEST CREATURE THAT EVER LIVED AND MOVED ABOUT ON THE EARTH WAS THE CARCHARODONT SHARK, OF THE OLIGOCENE PERIOD..THERE WAS ROOM ENOUGH IN THIS FEROCIOUS MONSTER'S MAW FOR A FOURSOME OF BRIDGE..THOUGH HE PREYED UPON EVERYTHING THAT CAME WITHIN REACH HE HAS PERISHED UTTERLY FROM THE EARTH - WHILE THE EQUALLY ANCIENT WHITE SHARK IS STILL GOING STRONG!



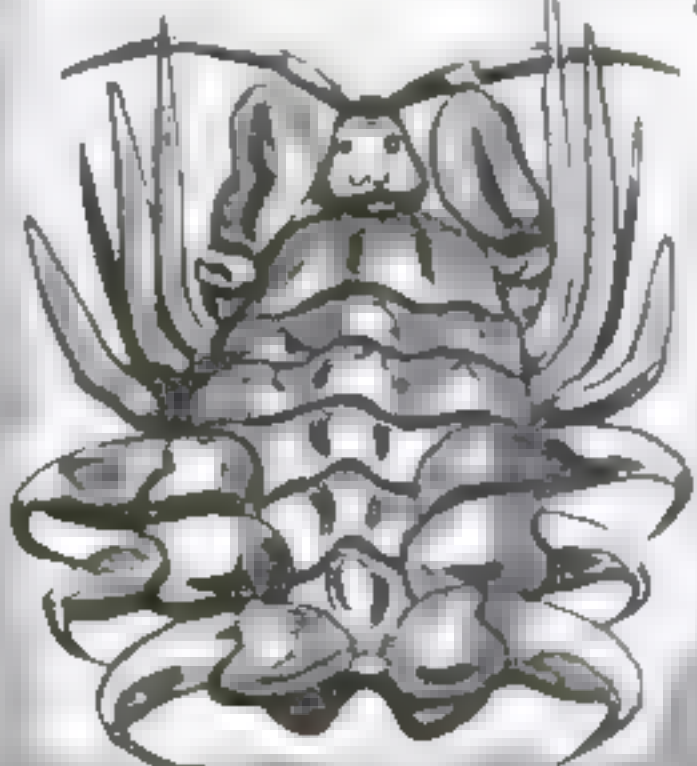
## APPLE TREES

HAVE PHYSICAL BREAKDOWNS FROM LOSS OF SLEEP! STURDY CHILDREN OF THE NORTH, THEY THRIVE ON WINTRY BLASTS THAT NIP THEIR LEAVES AND PUT THEM TO SLEEP FOR LONG NAPS. BUT, BROUGHT SOUTH OF THEIR NATURAL HABITAT, THEY KEEP WORKING OVERTIME, GROWING LEAVES AND BLOSSOMS ALL THE YEAR 'ROUND, UNTIL THEY WORK THEMSELVES TO DEATH!



IT'S A STRANGE PARADOX THAT THE LARGEST CREATURE LIVING TODAY, THE RIGHT WHALE, FEEDS ON THE SMALLEST FORMS OF LIFE - MILLIONS OF TINY SHELLFISH THAT HE SIFTS OUT OF GIANT MOUTHFULS OF WATER THROUGH HIS WHALEBONE STRAINERS!

AND, SPEAKING OF WHALES, WHO WOULD IMAGINE THAT THEY ARE TROUBLED WITH COOTIES? YES, INDEED - HERE IS A PICTURE OF A WHALE LOUSE, A PARASITE FOUND HITCH-HIKING ON WHALES AND DOLPHINS!

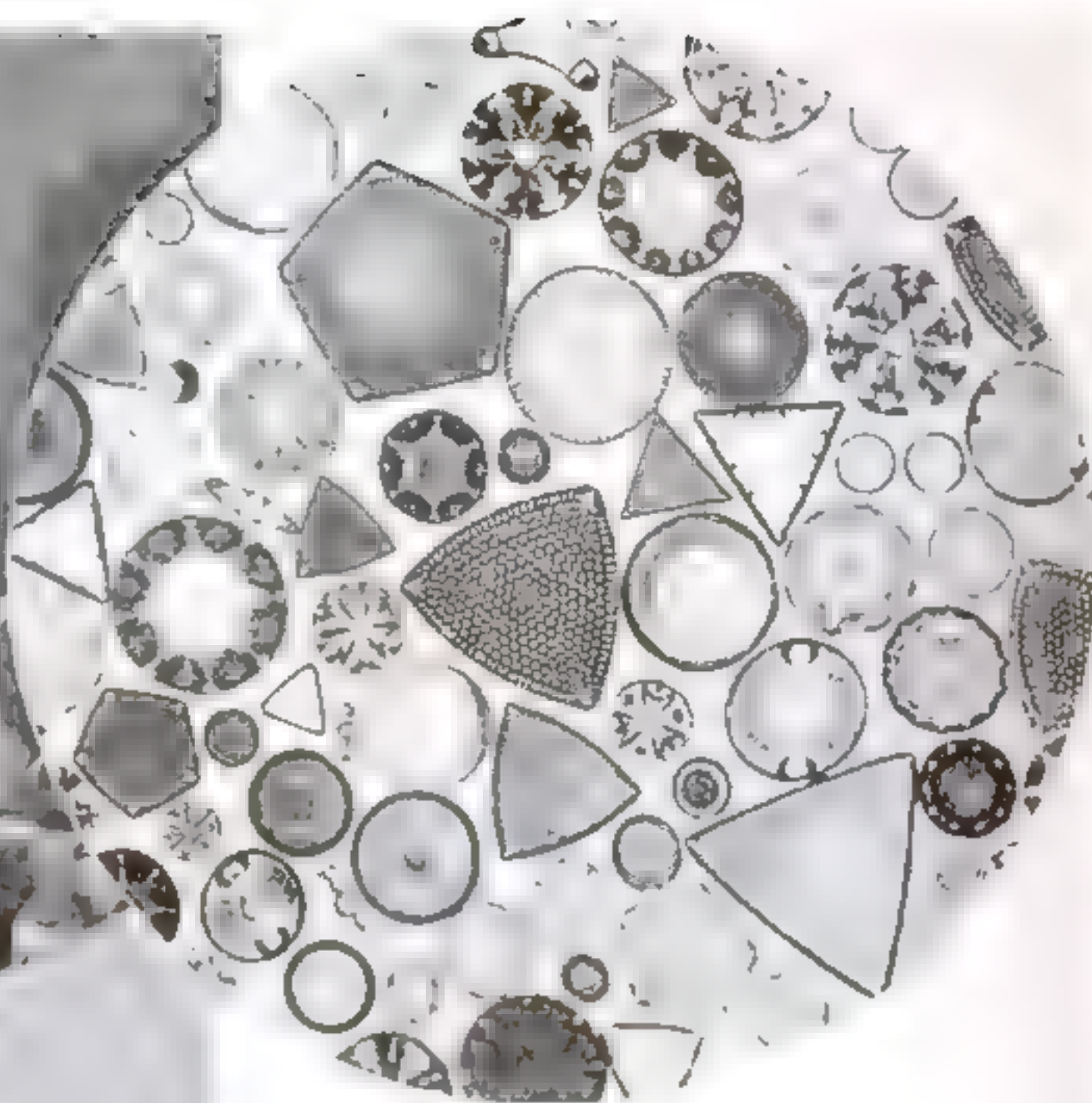


NORWAY'S ONLY NATIVE ANIMAL, THE LEMMING, IS NO LESS THAN A PLAGUE! IN CERTAIN YEARS, THESE LITTLE RATLIKE CREATURES SWARM DOWN FROM THE MOUNTAINS IN MIGRATIONS AND CLEAN OUT THE FARMERS' CROPS. THEY STOP FOR NOTHING UNTIL THEY COME TO THE OCEAN AND DROWN!

HERE WE HAVE THE ORIGINAL VACUUM CLEANER, THE HARLEQUIN CATFISH! HIS MOUTH IS A BAG WITH WHICH HE SUCKS UP OR LIFTS ASIDE GRAVEL, MUD, AND PEBBLES LOOSENED FROM THE RIVER BOTTOM BY HIS TWO ODD FEELERS!







Here are just a few of the many varieties of diatoms. Bringing out the fine details is a good test of your microscope's resolving power

# Nature's Jewel Boxes . . .

## Wonders of Plant Skeletons REVEALED BY YOUR MICROSCOPE

**D**ID you ever see an exquisitely carved jewel box, made of precious metal or crystal, and ornamented with delicate handwork? A box that has a bottom part and a lid that fit snugly together with sides overlapping?

You can find such examples of the jewelry-maker's art in many museums, some of the specimens dating back for hundreds of years. But in almost any wayside ditch, you can find countless miniature jewel boxes that may be many *thousands* of years old, and whose beauty and delicate detail far outshine anything ever made by man.

Found in garden pools, streams, lakes, and seaside puddles, these microscopic works of art are known as diatoms, or, to give them their scientific name, Bacillariaceæ or Diatomaceæ. They are among the most fascinating wonders upon which the microscopist can turn his magic lenses.

Diatoms are classed by biologists as algæ. They are one-celled plants, generally yellow in color in their living form. Sometimes they may be strung together to form chains, like fairy necklaces, or they may collect in masses. The membrane of the single cell is made hard and rigid by silica, which is glasslike in appearance and of the same chemical composition as silica sand. But the difference between a diatom and a grain of sand is greater than that between a milk bottle and a cut-glass punch bowl turned out by a master craftsman.

The silica membrane or "skeleton" of

the diatom consists of two plates called valves. In most diatoms, these parts fit together like the halves of a flat pill box, their edges overlapping. This overlapping region is called the "girdle" side.

It is because of the markings on its silica skeleton that the diatom is famous as a microscopic object. The surfaces of the valves are covered with lines, grooves, dots, and striations arranged in systematic order to form a decorative scheme rivaling the carving on a piece of jewelry.

Many diatoms are able to move about in the water in which they live. You can see them swimming across the field of your microscope like little yellow animals; yet they are classed as plants. These lit-

tle one-celled creatures have two ways of reproducing themselves. In the "sexual" method, a single cell throws off its membrane, and unites with another diatom to form a sexual auxospore, or reproductive cell, from which new individuals develop.



### PREPARING DIATOM SPECIMENS FOR PERMANENT MOUNTING

Organic matter is first removed by careful boiling in acid, as above. The specimens are then washed with water. Upper right, dropping a little water containing diatoms on a cover glass. When the water evaporates, thin balsam is added, and the glass is cemented to a slide, as at right



# Scooped from The Mud of Any Garden Pool, Tiny, One-Celled Diatoms Prove Fascinating Specimens for Study Under The Magic Lens

By Morton C. Walling

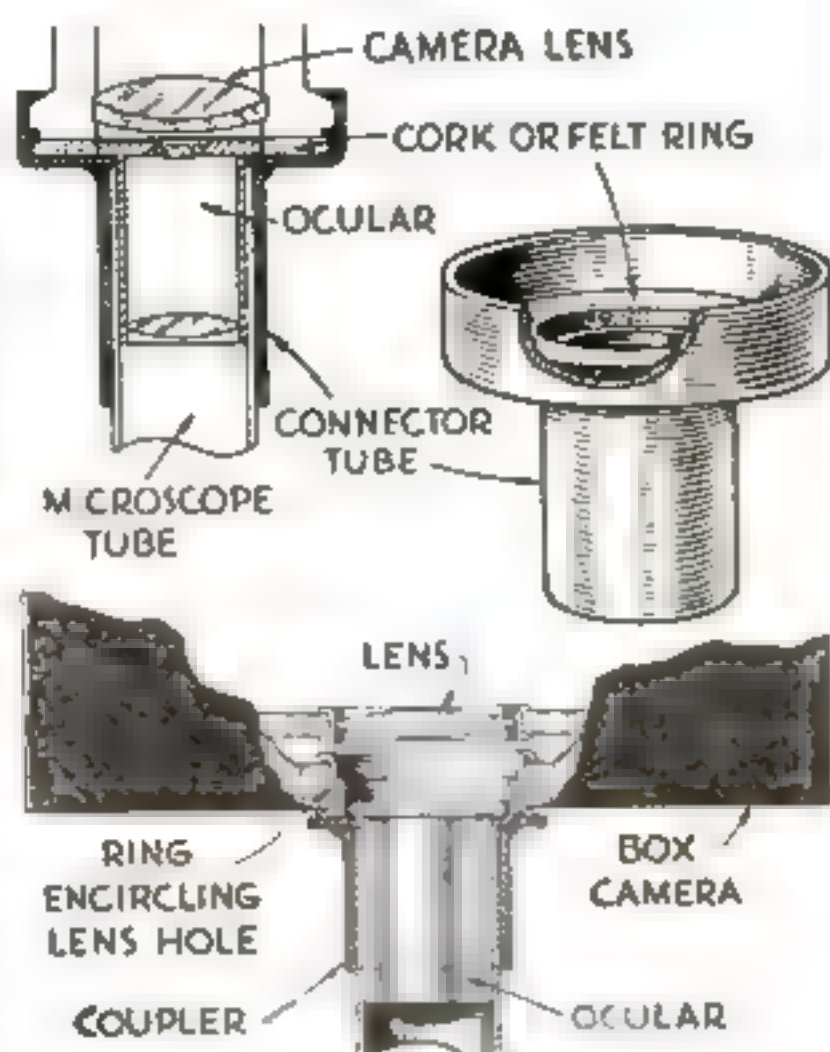
In the "asexual" method, a cell discards its membrane and then changes into one and sometimes two auxospores.

Diatoms are among the most plentiful microscopic bits of life to be found. Their distribution is world-wide. You will find them in both fresh and salt water, in every pond, sluggish stream, seaside puddle, and back-yard lily pool—in fact, wherever water stands in a relatively stagnant condition for a length of time. They also occur in swiftly flowing streams, but there they may not be easy to collect.

You can find diatoms in winter or summer, whenever it is possible to collect some of the mud on a pond bottom. With a large spoon, a long dipping tube, a net made by sewing a muslin bag to a loop of wire attached to a long handle, or even a wide-mouthed glass bottle, you can skim a thin layer of mud from the bottom of a pond. Select, if possible, places where yellowish-green patches are visible on top of the mud. Filaments and raglike formations attached to the roots of water plants, submerged stones, and sticks, usually are rich in diatoms. Moss of various kinds may provide abundant material. Diatoms of the sea can be found adhering to shells, coral, and other underwater objects.

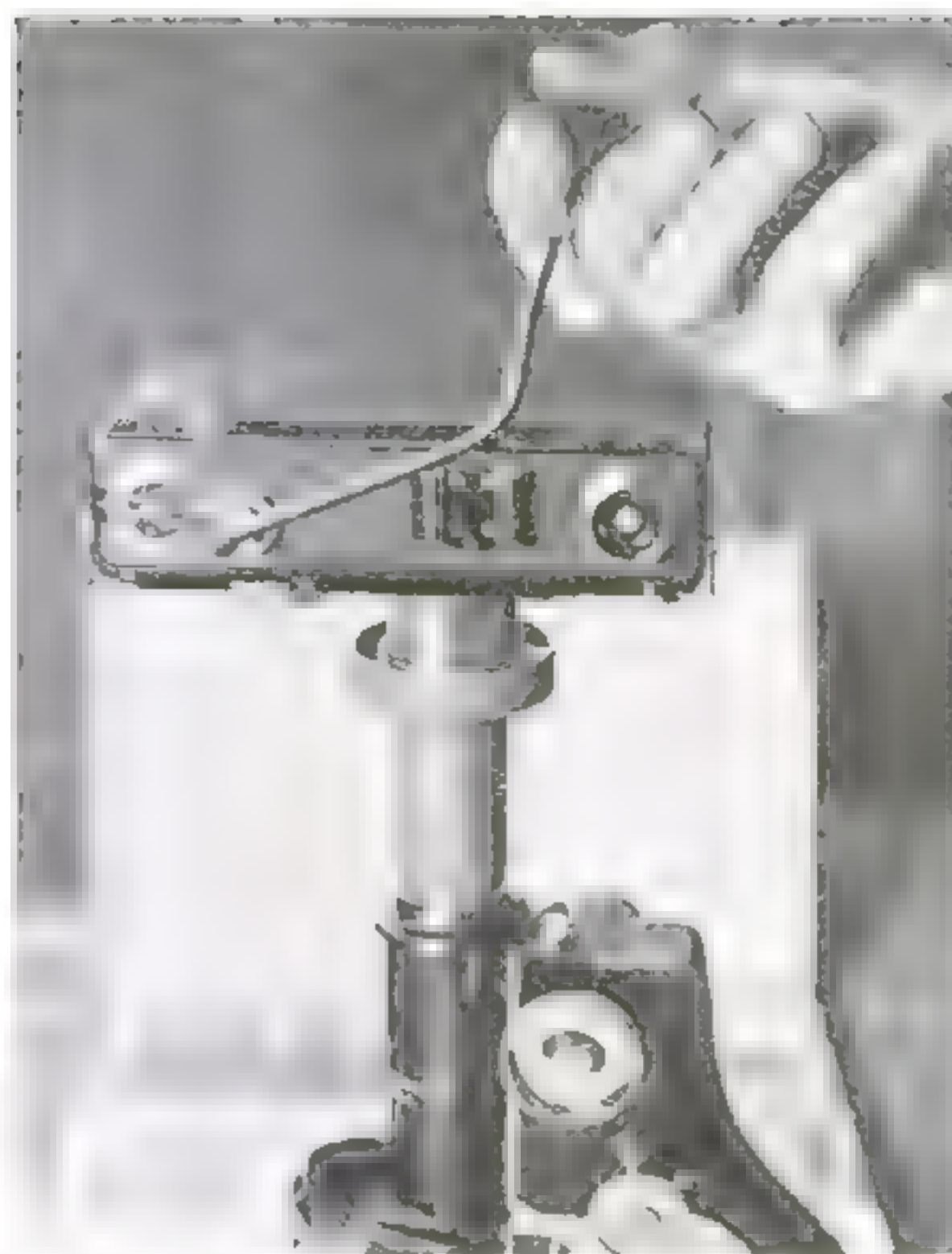
After you have gathered a supply of material that you suspect may contain diatoms, return to your laboratory and prepare for one of the most interesting investigations you ever attempted with your microscope. With a dip tube, lift a bit of the settled matter from the bottom of one of your collecting bottles and deposit it on a slide. Add a cover glass, being sure there is sufficient water to provide complete immersion but not much more.

You can identify the diatoms by their brilliant yellowish color, and their symmetrical glass skeletons. Some of the skeletons will be empty. These are the silica remains of diatoms that may have



## HOW TO PHOTOGRAPH DIATOMS WITH AN ORDINARY CAMERA

By constructing one of the couplers shown above, you can mount any folding or box-type camera on the eye-piece of your microscope for making a permanent photographic record of an interesting specimen. The camera lens should be focused at infinity



lived centuries ago, for these tiny, marvelously formed bits of glass are virtually everlasting.

Diatoms range in size from tiny specks up to about the dimensions of a period on this page; a microscope is the only key to their wonders. Do not expect to see all the details with your instrument, for even the finest and most powerful lenses made have difficulty in resolving some of the details of diatoms. For instance, photomicrographs showing cilia are comparatively rare. Cilia are the minute, hairlike appendages that project through the glass skeleton and, by waving back and forth in the water, enable the diatom to swim. Dots and other markings on the silica valves are so fine that they are employed to test the power of oil-immersion objectives and other microscope lenses.

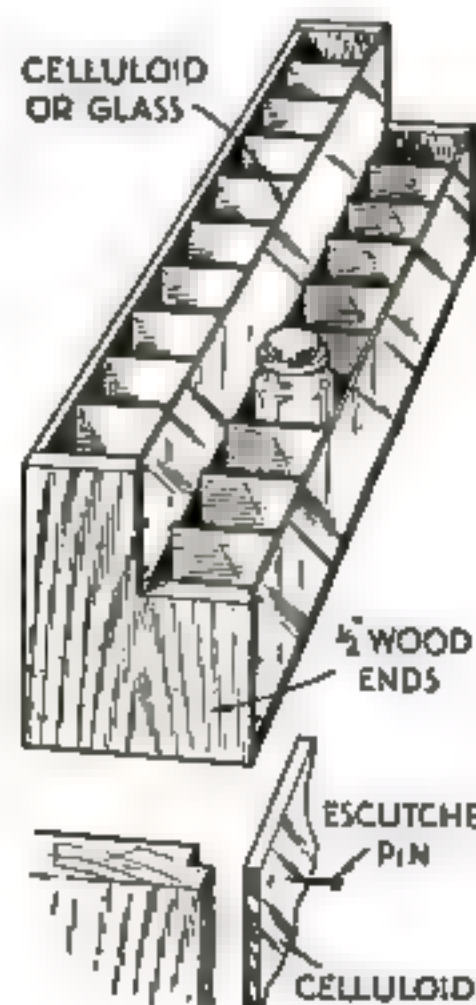
But even though your microscope may lack the magnification and the resolving power required to reveal the more detailed

wonders of these tiny objects, it still can make visible a wealth of detail if it magnifies 100 or more diameters. There are so many varieties of diatoms that you might spend your entire life studying them, and still fail to see all existing forms.

The silica valves usually are the parts preserved in permanent preparations, for they are the most interesting. Before you can mount them, it is necessary to remove the organic matter. Sometimes, simply boiling the diatoms in nitric acid, and then washing them well with water, will be sufficient. However, expert diatom handlers usually employ a more involved process. In handling any of the acids mentioned here, do so with extreme care and in a well-ventilated place. Do not breathe the fumes, and keep the chemicals away from your clothing and skin.

To separate diatoms from organic material, bits of shells, or other matter, place a quantity of *(Continued on page 116)*

## Storage Racks for Reagent Bottles Are Easily Made



### BOTTLE RACKS

The problem of storing reagent bottles is easily solved by building this handy double-level rack



KEEPING reagent bottles in order and more or less free from dust is a problem that can be solved in various ways. One method is to keep those that are used most grouped at one side of the microscope desk, under a bell jar made from a one-gallon glass jug from which the bottom has been cut, as indicated at the right. This keeps dust off, but lacks something in the way of systematic arrangement. A long rack, with a place for each bottle, is better, especially for those reagents that are less frequently used. A convenient unit of this type can be made as shown in the drawing at the left. The use of celluloid permits the labels to be read easily, and hinged covers may be provided, if desired, to keep off dust.

WOOD OR METAL POST WITH HOLE THROUGH MOST OF LENGTH

TOP DISK RESTS ON CENTER PIN



WOODEN DISK WITH HOLES FOR BOTTLES

1-GAL. GLASS JAR WITH BOTTOM REMOVED



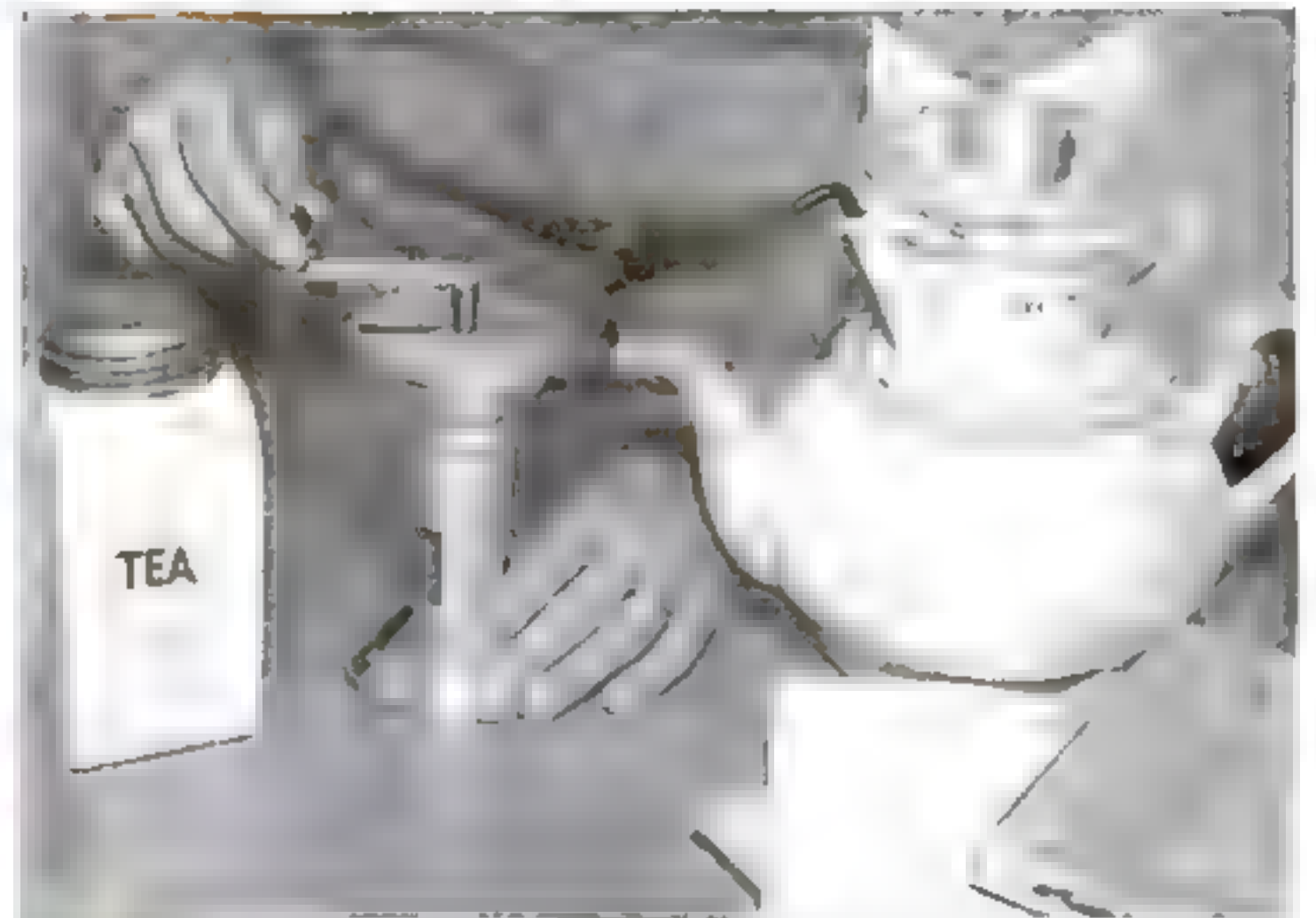


HOMEMAKERS' TASKS  
MADE EASIER BY NEW

# Household Utilities



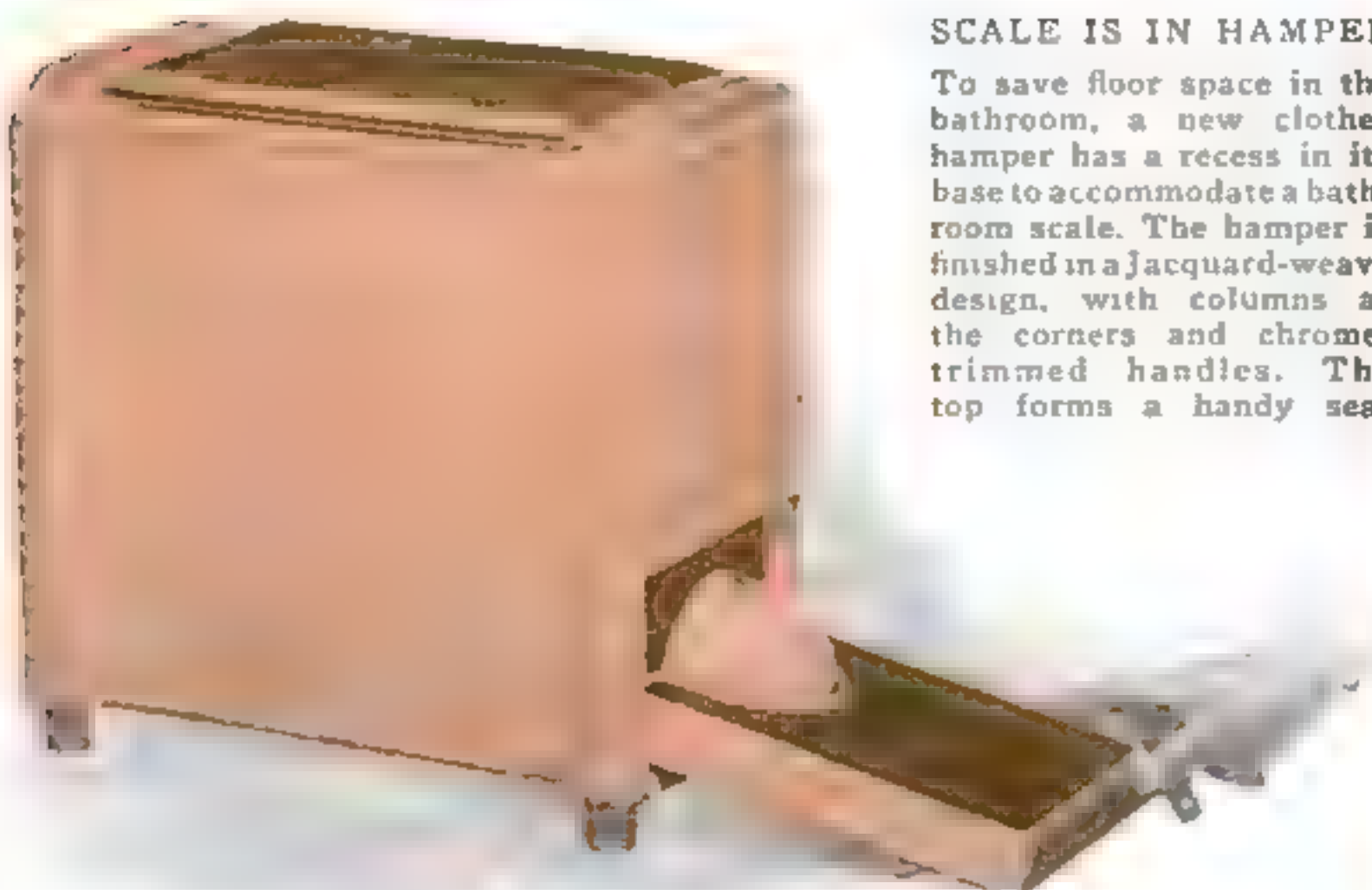
**KEEPS MIST OFF WINDOWS.** Kitchen and bathroom windows and mirrors are kept free from mist by the use of a new preparation. Packed in jars, the paste is applied to the glass with a soft cloth and is said to prevent clouding for a long time.



**DRIP TEA MAKER.** Resembling the conventional filter-drip coffee maker, this pot makes tea by the same process. A special grinder provided is used to powder the tea before it is placed in the filter.



**IMPROVED CLEANER BAG.** In a new dust bag that fits any vacuum cleaner, dirt is blown to the top and held in a large storage sack so that it cannot clog the suction mechanism. The bag is easily emptied at the top.



#### SCALE IS IN HAMPER

To save floor space in the bathroom, a new clothes hamper has a recess in its base to accommodate a bathroom scale. The hamper is finished in a Jacquard-weave design, with columns at the corners and chrome-trimmed handles. The top forms a handy seat.



**DIAL CHART FOR STAIN REMOVAL.** Directions for removing stains are given on this handy chart. A dial is turned to the name of the staining substance, and symbols show treatments for various materials.





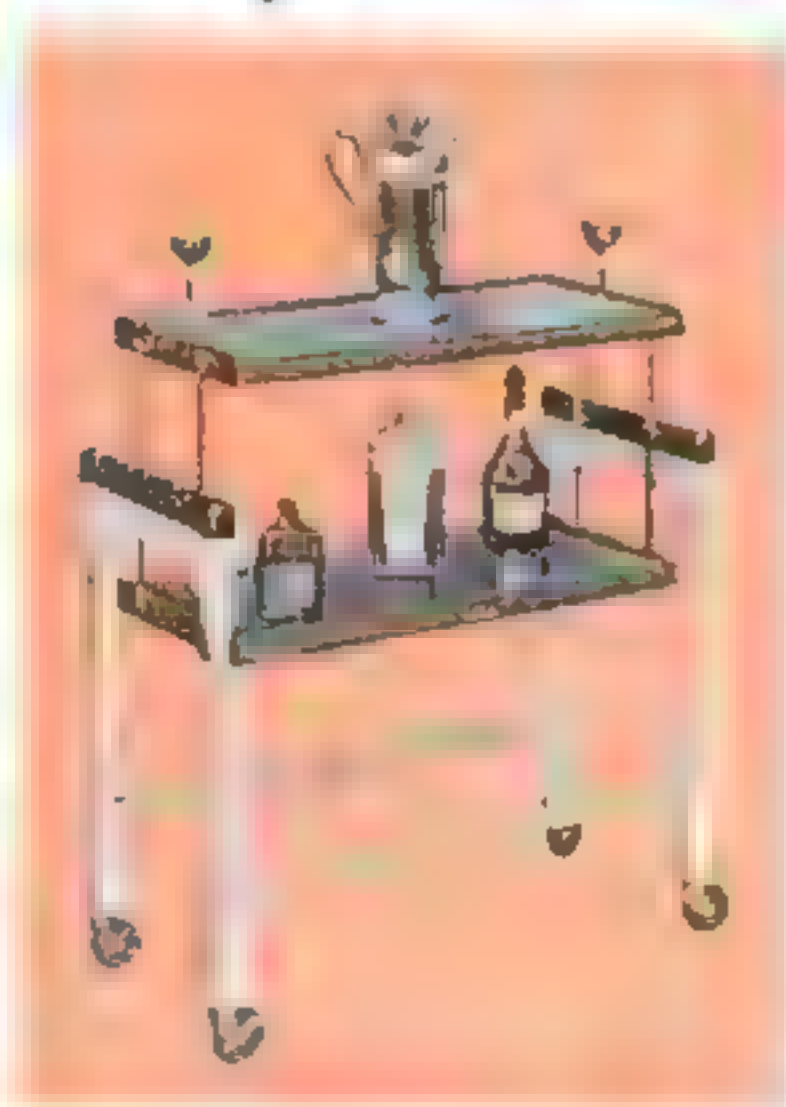
**ADJUSTABLE FLOWER HOLDER.** The novel construction of this flower holder makes it fit bowls of many sizes, as the three sections may be spread wide or telescoped together. The base is rust-resisting



**FOLDING ELECTRIC STOVE.** The two heating elements of this small stove are set in a hinged frame that folds up for carrying and storing. In addition to regular cooking, it can be used for making toast as shown above, and to heat a room



**DOORSTOP.** A simple device, consisting of two corrugated rubber shoes joined by a strip of spring metal, holds a door in any position when placed as illustrated above



**ROLLING SERVER AND TABLE.** Mounted on rubber-tired casters, the table shown above can be used for serving or for bridge. The top is divided into two parts which may be swung into position one above the other, or to form a single surface as shown at the right

**DOUBLE FRYER.** In the novel utensil at the right, two large aluminum skillets are combined to serve a wide range of uses—as a double fryer for chicken, a Dutch oven for top-of-range roasting and baking, and a vapor-seal roaster. The skillets also can be used separately if desired



**REFRIGERATOR HAS HANDY TRAY.** Striking features of a new refrigerator are a swinging glass food compartment and a pull-out tray at the bottom for holding things that have been taken out temporarily





# Chemical Matchmakers

HOME EXPERIMENTS  
SHOW STRANGE BEHAVIOR  
OF CATALYSTS



**COPPER AS A CATALYST.** When a mixture of ammonia vapor and air is passed over hot copper filings, in this experiment, ammonia is oxidized and the product dissolves in water to form nitric acid

ONE of the simplest-looking, yet most mystifying, of kitchen utensils is the "fireless" gas lighter. Turn on the gas, poke this handy little device above the burner, and a tiny wire glows red-hot. Presto—the gas lights. What makes the thing work?

The answer is that it contains a "catalyst"—one of a large group of substances whose curious behavior you will enjoy investigating in your home laboratory. All have the strange power of assisting other chemicals to interact, merely by their presence, without entering into the reaction themselves. You might call them chemical go-betweens or matchmakers. Because certain reactions will not occur without their help, catalysts play a vital role in modern industry. Great quantities of sulphuric acid, for example, are made with their aid—and it has been said that the advancement of a nation can be measured by its consumption of sulphuric acid, so useful and necessary is this chemical to our daily needs.

Not only does the humble gas lighter represent one of the most familiar applications of catalysts, but it also affords a good starting point for home experiments with them. If your household lacks such a lighter, you can pick one up at small cost wherever kitchen utensils are sold. Avoid the striking or sparking variety; the kind you want has no mechanical action, but simply contains a delicate wire within a protecting spiral guard.

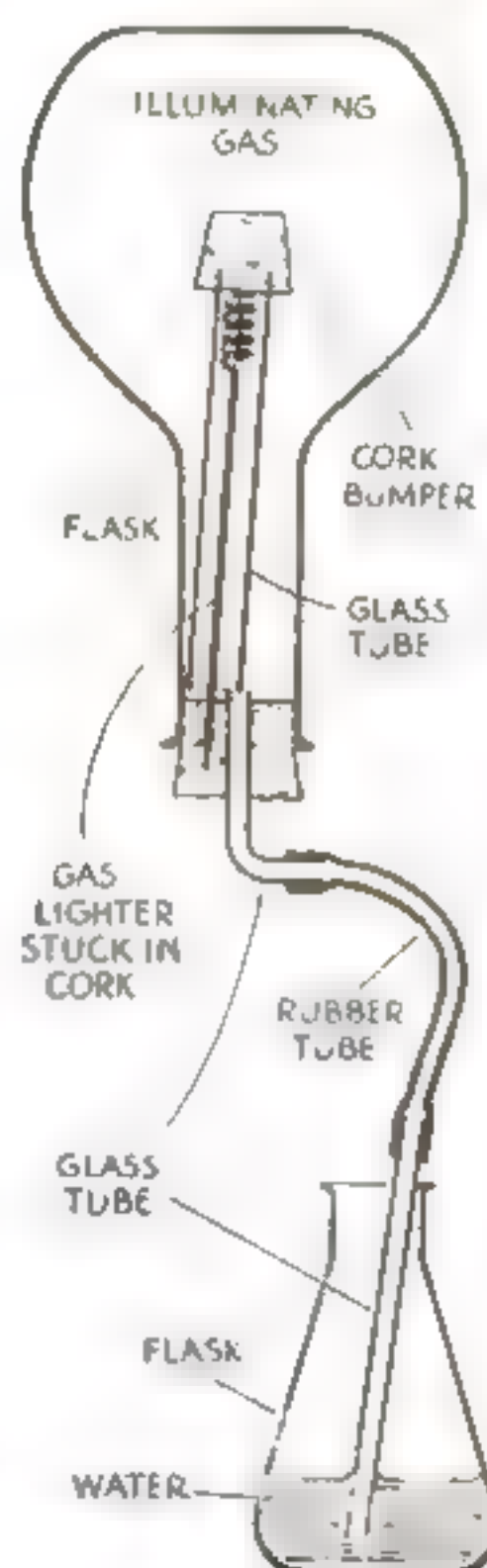
Mount a lighter of this type above the wick of an unlighted alcohol lamp, and you will see the wire begin to glow. As it does so, it radiates heat that continually volatilizes more alcohol. If the wire is

shielded from chilling drafts, it will remain red-hot for several hours. You can improvise a shield by breaking out or cutting off the bottom of a test tube and using the remaining section as a glass chimney. Do not fit it down snugly over the lamp, but leave a small opening near the wick to allow air currents to enter and carry the alcohol fumes past the wire of the lighter.

This active part, which serves as a catalyst, is a wire carrying a bit of platinum or palladium black—a finely divided form of platinum or palladium metal. Its presence enables the alcohol vapor to combine with the oxygen of the air, even in the cold. The reaction liberates enough heat to raise the wire to glowing temperature.

Similarly, when you hold the lighter over an opened gas burner, the platinum catalyst promotes a reaction between the gas and the surrounding oxygen, and the wire glows with the resulting heat. In this case, the temperature of the glowing wire is high enough to ignite the gas.

Lower your gas lighter into the upper part of a flask containing a strong solution of ammonia water (ammonium hydroxide). Again its wire will glow. In this case, it is the ammonia vapor that is oxidized, or aided to combine with the oxy-



## How a Gas Lighter "Adsorbs" Gas

When the large flask is turned right side up, the "fireless" gas lighter is exposed to the illuminating gas. Water is drawn up into the glass tube at the bottom of the apparatus, showing that the rare metal in the lighter is "adsorbing" the gas

gen of the air, by the catalyst. If the gas lighter refuses to work after a while, it can be "activated" or restored to service by holding it in a blue flame to burn out impurities.

Plain platinum wire can be substituted for the gas lighter as a catalyst in this experiment. A small length—about two inches or so—can be obtained from a chemical supply house for considerably less than a dollar. If you have such a piece, coil it into a little spiral, heat it red-hot in a Bunsen flame, and quickly lower it into the flask of ammonium hydroxide. Suspended above the liquid, it will glow for many minutes.

The ability of rare metals such as platinum to "adsorb" gases, or hold them adhering to its surface, seems to play an important part in the metals' behavior as catalysts. So marked is this power when





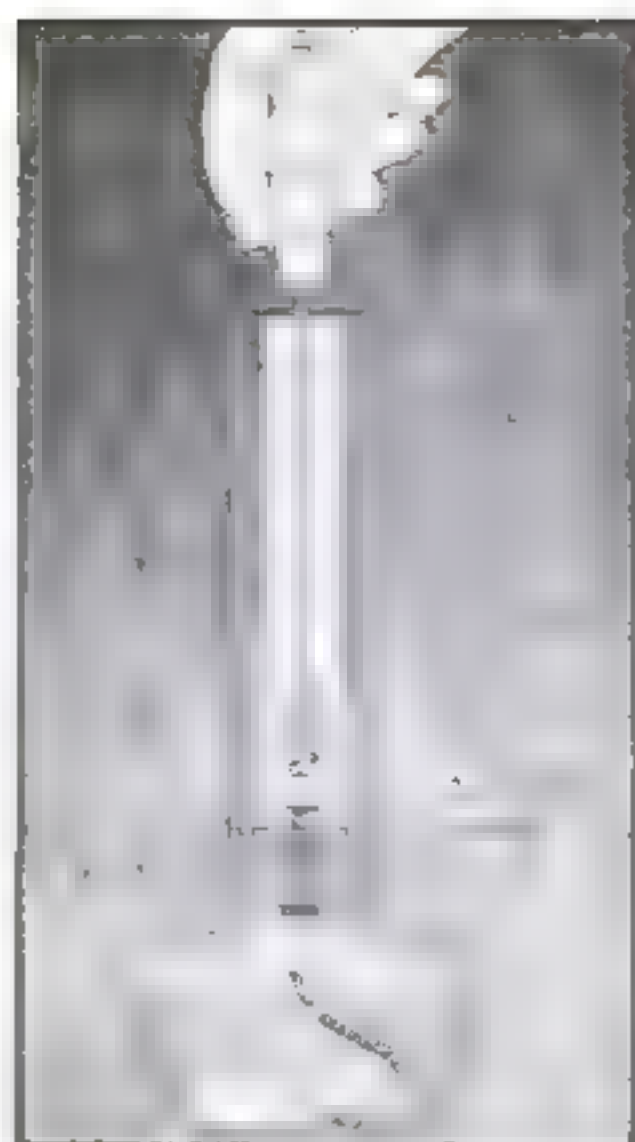
the metal is finely divided, as in the specially prepared form used in gas lighters, that huge quantities of gas can be adsorbed. If you expose a lighter to illuminating gas in a closed system, such as a stoppered flask, you can actually observe the removal of a part of the gas.

Fix the gas lighter to the inner side of a one-hole cork, fitted with rubber tubing leading to a glass tip that dips into a beaker of water. Cover the lighter with a glass tube, closed with a cork and fitting loosely. Now thrust the cork with its attachments into the mouth of an inverted flask that you have filled with illuminating gas.

This tricky little arrangement permits you to expose the lighter to the gas, when you are ready, simply by turning the flask right side up. The tube falls off, its cork acting as a bumper to avoid cracking the flask; and the illuminating gas comes in contact with the rare metal in the lighter, which adsorbs it.

Watch the tubing that dips into the beaker. You will see water rising in it, perhaps as much as several inches, as a result of the partial vacuum produced in the flask by adsorption. This is the more striking when you recall that heat is generated by placing the lighter in the gas, which would tend to make the gas expand instead of shrink. If the heating effect were absent, therefore, the loss in volume of gas produced by adsorption would be considerably greater.

Costly metals are not the only ones that show "catalytic" properties. While German chemists used platinum in developing a large-scale wartime method of making nitric acid from ammonia, you



A gas lighter mounted above the wick of an unlighted alcohol lamp, inside a glass shield, will glow for hours

can duplicate the process with ordinary copper as the catalyst. The method consists of oxidizing the ammonia, as in experiments already described in this article; and then absorbing the resulting oxides of nitrogen, in water, to obtain dilute nitric acid.

Place some copper filings, or three or four strands of copper wire, in a piece of glass tubing ten to twelve inches long. Mount the tubing horizontally, with the aid of a split cork and a laboratory support, so that the copper can be heated with a fishtail burner, or a Bunsen burner equipped with a flame-spreading attachment. At the mouth of the tubing, suspend a

small wad of absorbent cotton moistened with ammonia water.

The rest of the apparatus consists simply of a flask or bottle containing about an inch of water and one or two pieces of blue litmus paper, to catch and test the product of the reaction; and a suction attachment to draw the ammonia vapor through this set-up. As shown in one of the diagrams, the glass tubing first leads to the bottom of the collecting flask. A second section of tubing connects the top of the flask with the top of a gallon jug of water, which serves as the suction pump. A final length of tubing, running from the bottom of the jug to a lower level outside, acts as a siphon.

Start the water flowing, by sucking on the siphon tube, and air and ammonia vapor will be drawn in through the glass tubing containing the copper. The air-ammonia mixture then bubbles through the water in the flask. By using a pinch clamp between the flask and the suction jug, the flow of gases may be controlled

and kept constant at about two or three bubbles a second. Meanwhile, the glass tubing that holds the copper should be kept heated nearly to its softening point.

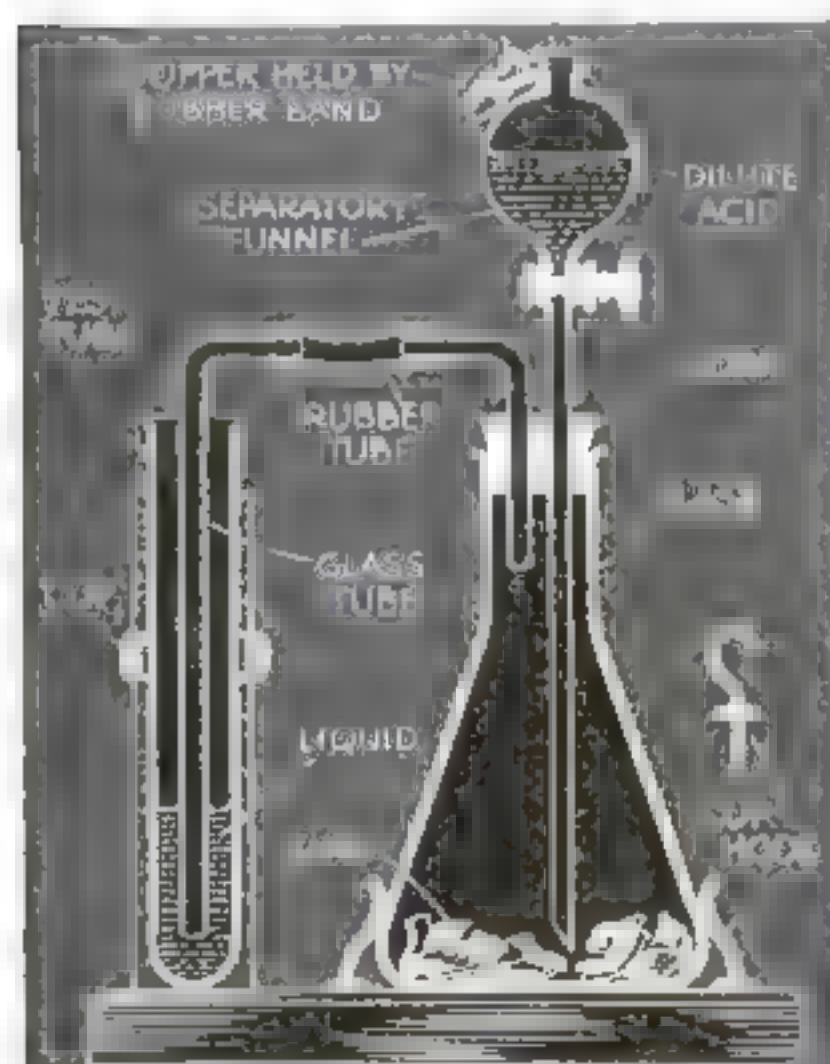
Acting as a catalyst, the heated copper unites the oxygen from the air with the ammonia and produces an oxide of nitrogen. This, in turn, dissolves in the water in the flask to form nitric acid. In consequence, you will see the litmus paper in the flask change color from blue to red. Hydrogen from the ammonia also combines with the oxygen from the air, producing water, as evidenced by the dew that condenses in the cooler part of the glass tubing.

Try substituting manganese dioxide for copper in this experiment. You will find that it also will work as a catalyst. It should be dried by heating it before use.

Just what is the explanation of the mysterious behavior of catalysts? One of the most interesting theories suggests that a substance such as hydrogen briefly forms an unstable chemical compound with the catalyst. When released from this compound, the hydrogen is in a more active form—called atomic, "nascent," or new-born—which reacts more readily than the familiar variety of hydrogen.

In none of your previous experiments, probably, have you encountered this curious new-born gas. When you make hydrogen gas by adding acid to a metal, what you get is a stream of hydrogen "molecules," each one composed of a lightly joined pair of still smaller "atoms" of hydrogen. But these atoms were not always Siamese twins. When they were born in the acid-metal reaction, they were separate individuals. In the fleeting instant before they paired off with one another to form molecules, the hydrogen was in the state known as "nascent," or new-born. You might be surprised if you could test its chemical properties while it was in this condition, for it behaves quite differently from ordinary hydrogen gas. And, fortunately, it is possible to make such tests, despite the fact (*Continued on page 126*)

## Observing "New-Born" Hydrogen



Hydrogen gas can be manufactured conveniently for the test of its properties in the nascent state, and for other home-laboratory experiments, with this simple apparatus



Passing an electric current through a dilute acid produces hydrogen which, in its "new-born" condition, reacts with sulphur to form hydrogen sulphide gas, which is detected by its effect on paper moistened with lead acetate solution

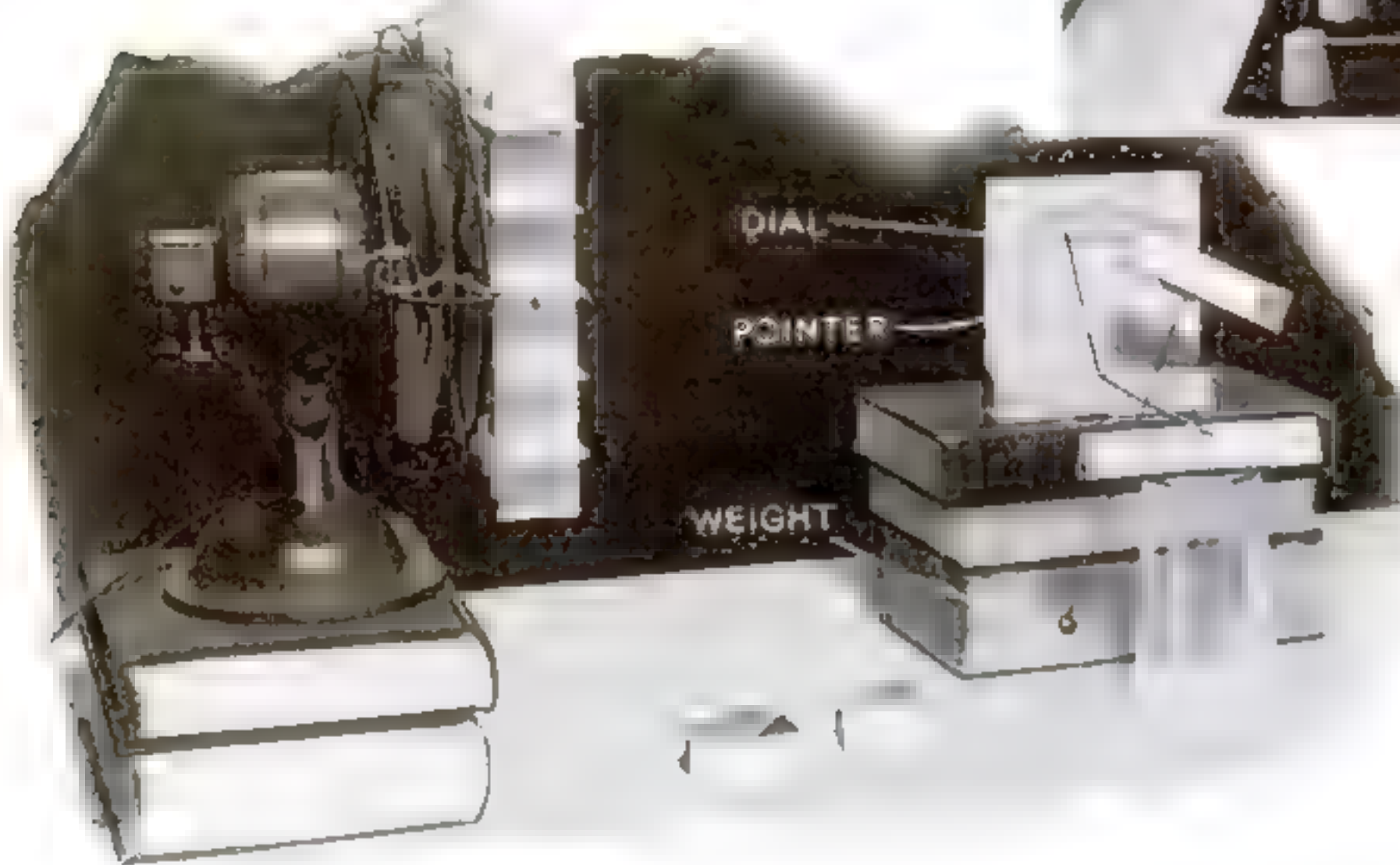


# Scientific Stunts

FOR THE HOME  
EXPERIMENTER

## *Simple Apparatus Gauges Relative Air Resistance*

THE relative air resistance of small bodies of different shapes can be determined with the simple apparatus shown below. Cardboard models are attached to the upper end of a wire which is joined to a combined pivot and pointer and has a weight at the lower end to keep it normally upright. Wind is directed against the model by an electric fan with an egg-box partition frame in front of it to straighten out the air currents.



## *Red Ink Becomes Green Under Reflected Light*

SOME of the aniline dyes have different colors when viewed by transmitted and by reflected light. To demonstrate this, pour a little aniline red ink into a glass of water and look through it toward a light. It will appear a deep orange-red. Now put a few drops on a sheet of glass and view with light shining across the surface, and it will be green.

## *Pulverizing Robs Glass of Its Color*

DARK-COLORED glass seems to get lighter when it is pulverized, because the small particles allow less penetration by light. If a little water is dropped on the powder, much of the color is restored, because the liquid destroys some of the surface reflection.



## *Shadow of Candle Flame Shows Gases and Air Currents*

COVER an electric-light bulb with a tin can in the side of which a half-inch hole has been cut, and place it so that it will throw a sharp, narrow beam of light on a candle flame. On a screen behind the candle you will see a shadow, not only of the flame but of the gases and air currents around it.

## *Miniature Lightning Rod Protects Paper "House"*

TO SHOW how a lightning rod guards a building, place a tiny paper "house" on a metal pie pan connected to one of the secondary terminals of a neon-sign transformer or a spark coil. When the current is turned on, a spark will jump from the other terminal to the paper, setting it afire. A frame of copper wire, slipped over a similar "house," will intercept the spark and lead it away harmlessly.



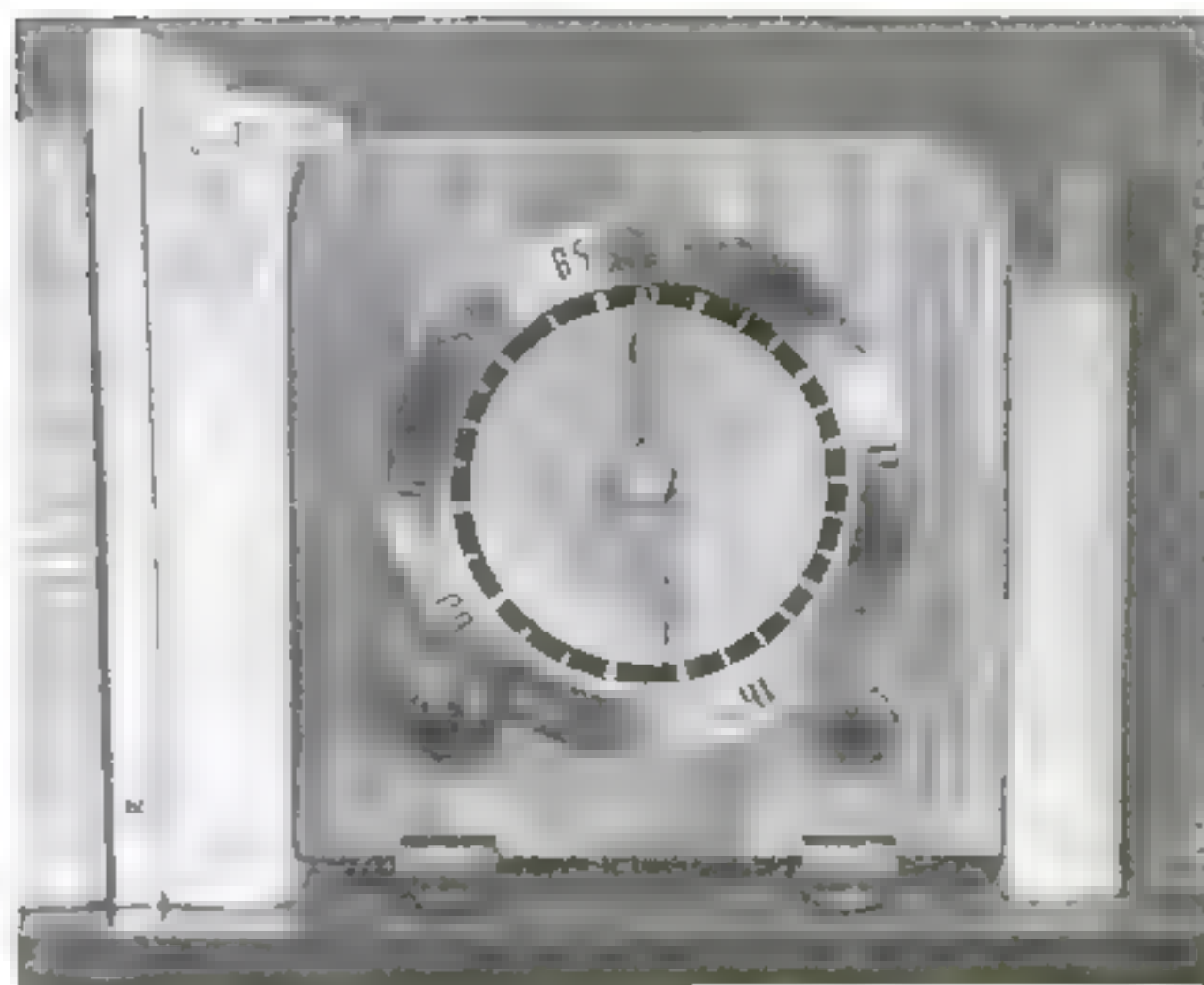


# NEW HELPS FOR Radio Builders

## *Midget Receiver Resembles Electric Clock*

**R**ESEMBLING an electric clock in appearance, and not much larger in size, a new midget four-tube A.C.-D.C. receiver makes a fine "companion" set for the kitchen, bedroom, or den. The instrument measures only seven and three quarters inches square and five inches deep, and employs a tuned-radio-frequency circuit. The indicating

scale, calibrated in kilocycles, is mounted around the edge of the loudspeaker grille. The dial pointer, shaped like a clock hand, is controlled by a knob through a reduction drive. The second knob on the front of the receiver is a combined volume control and on-off switch. Good volume and tone are claimed for the little radio.



This tiny set will fit in almost anywhere. Note the novel dial

## *Compact Wave Trap Filters Out Interference*



Adjusting the wave trap to eliminate interference

**I**NTERFERENCE from local transmitting stations can be eliminated or greatly reduced by the use of a new universal wave trap that is applicable to practically all types of receivers. The device is easily installed inside the cabinet, and is merely connected in series with the antenna. No connections need be made within the receiver circuit. The trap consists of a small coil and variable condenser, and its tuning range is from 435 to 1,700 kilocycles. The condenser is adjusted with a small screw driver to the frequency of the station that is causing the interference.

## *New Transformers Have Waterproof Coating*

A COMMON trouble with amplifying transformers—breakdown of the windings due to penetration of moisture—can be overcome by a new process that seals all exposed surfaces. A transformer so treated can be immersed completely in water without damage. The water merely forms in beads and rolls off, leaving the moistureproofing compound dry and shiny. A complete line of transformers and filter chokes, made by the new process, is now on the market.

A transformer being immersed in water to demonstrate moisture resistance of the coating



## *Ball-Joint Beads Insulate Wires*

FOR insulating flexible leads between transformers, power tubes, rectifiers, and other radio parts, constructors will find a new line of interlocking insulating beads convenient, effective, and inexpensive. Only a quarter of an inch in diameter, the beads are molded of ceramic material to form continuous ball-and-socket joints that can be bent at sharp angles without exposing the wire.



## *Wire Stripper Will Handle Many Sizes*



The wire stripper in use. It removes insulation without injuring the metal

**A**N INGENIOUS new wire stripper, which has hardened steel blades adjustable for use on solid or stranded wire up to twelve millimeters in diameter, removes all ordinary insulation quickly without cutting or injuring the wire itself. Intended to be screwed

down permanently, the device is used by simply placing the wire between the blades and pulling. An adjustable stop permits stripping of uniform lengths.

## *Battery Eliminator for Experimenters*

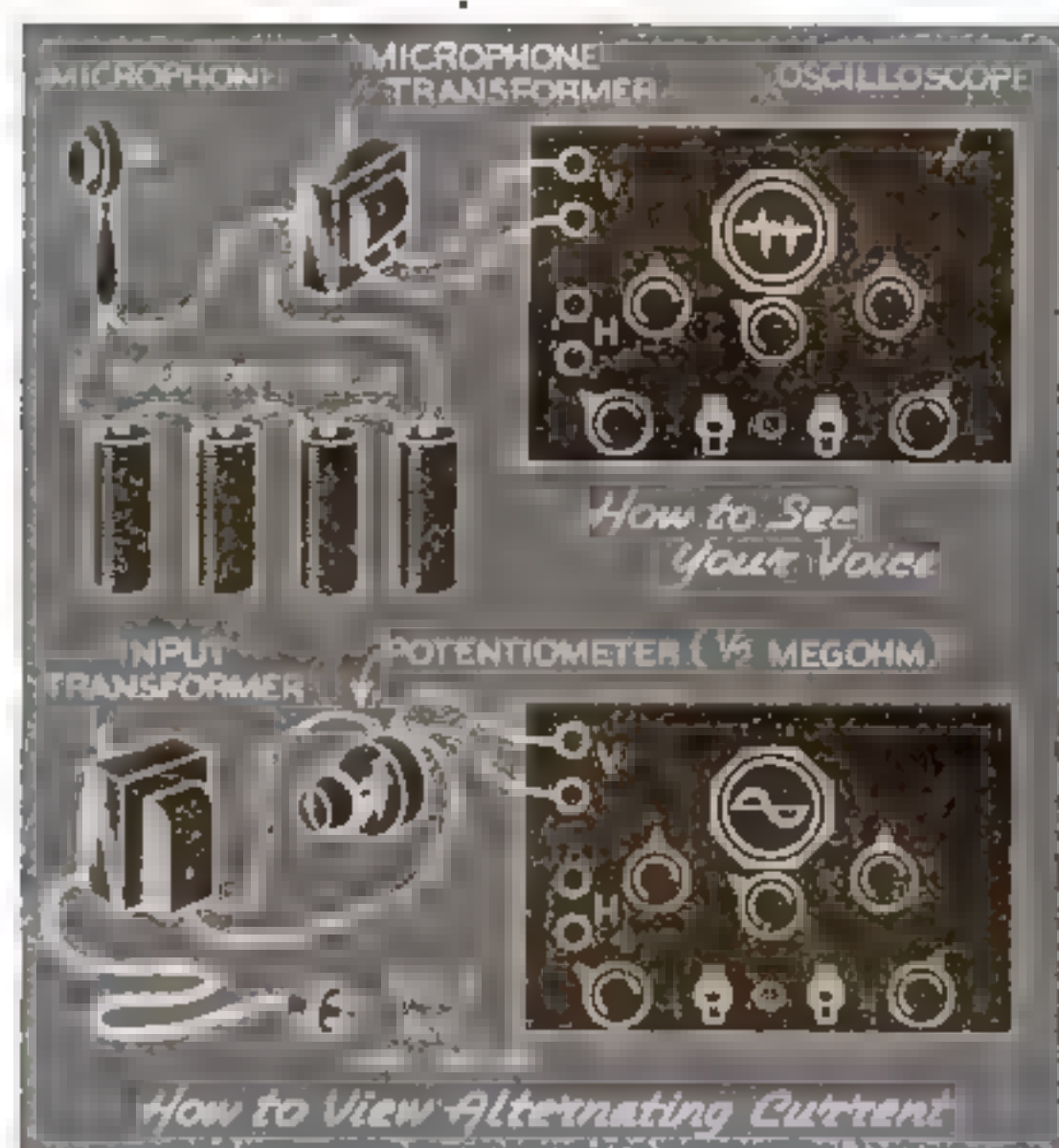
**P**ICTURED below is a storage-battery eliminator that works on 110 volts alternating current and delivers ten amperes of well-filtered direct current at six volts for operating and testing low-voltage radio and electrical instruments. The output voltage is conveniently controlled by a knob and is indicated by a built-in voltmeter. The actual voltage under load depends on the current drain, because of the voltage drop in the choke that forms part of the filter system. Under average conditions it ranges from four and three quarters to nine volts (in eight steps) with a load of ten amperes. The no-load voltage varies between nine and a half and fifteen and a quarter volts.

Output voltage is controlled by a knob and shown on a voltmeter





# EASILY BUILT Oscilloscope



The inexpensive oscilloscope in use. Employing a low-cost, midget cathode-ray tube, it is hooked up as in the diagram above to enable you to see vibrations from your own voice and the cycles in alternating current



Front view of the steel cabinet, showing the various controls. A flash-light lens covers the screen of the tube

By  
**HOWARD  
G.  
McENTEE**

**B**ECAUSE it makes sound visible, the easily built instrument illustrated forms a fascinating addition for the radio experimenter's workshop. With it you can actually see the vibrations caused by your voice, or watch the tiny waves that speed through electrical circuits.

Although known technically by the forbidding name "cathode-ray oscilloscope," the device consists simply of a straightforward hook-up that can be assembled easily from standard radio parts. To construct it requires no more time or experience than the wiring of a conventional three or four-tube receiver.

Until a few months ago, a professional-type oscilloscope was beyond the means of the average experimenter. Cathode-ray tubes were expensive. Now, thanks to a new midget, low-cost tube, a complete unit, cabinet and all, can be built for less than the price of the average homemade radio hook-up.

Anyone who understands the operation of an ordinary radio tube will have little

trouble understanding the functioning of a cathode-ray tube oscilloscope. As the name implies, a cathode-ray tube's operation depends upon the production of a beam, or ray, which is formed at the cathode of the tube. Just as in a regular radio tube, this cathode is warmed by a small electric heater and gives off tiny negatively charged particles, called electrons. However, instead of spreading in all directions, as they do in a radio tube, the electrified particles pass through a system of electrodes which focuses them into a concentrated beam. An optical analogy of the cathode-ray tube would consist of a lamp to give off light, corresponding to the heater and cathode, and two lenses, corresponding to the electrodes, to focus the light into a sharp point or spot.

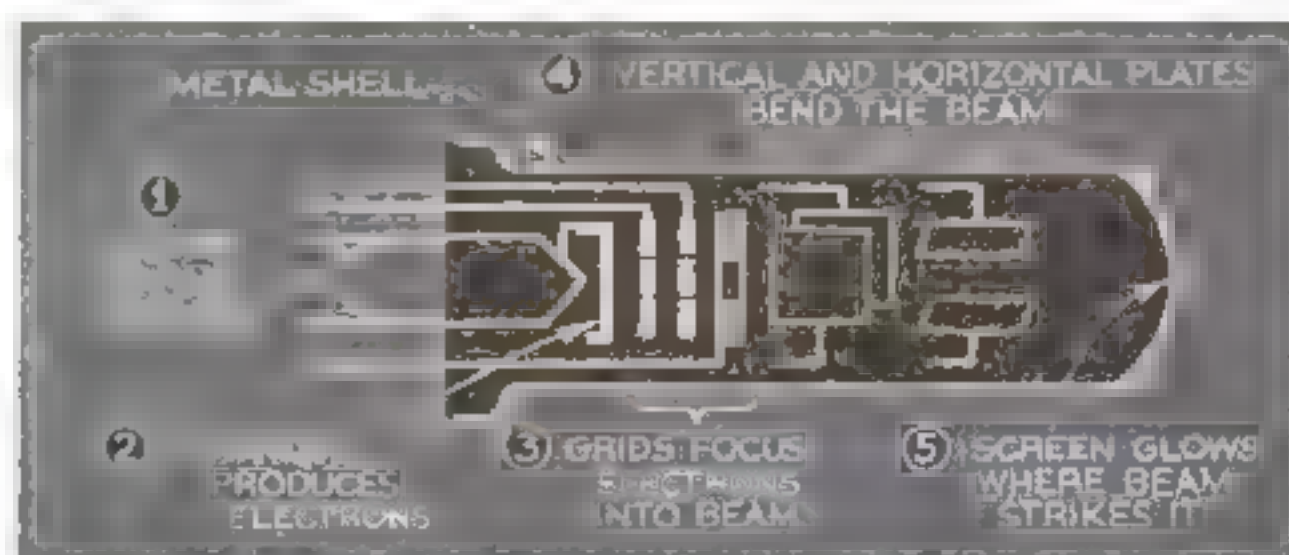
As the beam emerges from between the electrodes, it then passes between four

deflecting plates—two arranged vertically and two horizontally. Connected indirectly to a microphone, or a circuit being tested, two of these plates become electrically charged according to the variations in the current received. Being composed of negatively charged particles, the ray is attracted or repelled according to whether each plate is positively or negatively charged. Thus, as the charges vary, the beam is moved.

After passing the deflecting plates, the beam finally strikes a glass screen at the end of the tube. It is this screen that gives the graphic image of a voice or the motion pictures of electrical waves. Coated with zinc silicate (a mineral known as willemite), it gives off a bright yellow-green glow wherever the cathode ray strikes it. As the beam moves, the glowing spot on the screen moves, producing a visible pattern of the motions of the ray, and thus an accurate picture of the electrical vibrations being fed into the circuit.

The operating circuit, which when combined with the cathode-ray tube forms the complete oscilloscope, consists of three all-metal tubes—a 6X5, an 885, and a 6K7. As shown in the diagram, the wiring is entirely conventional. If the socket sketches are followed carefully, there is little chance for error.

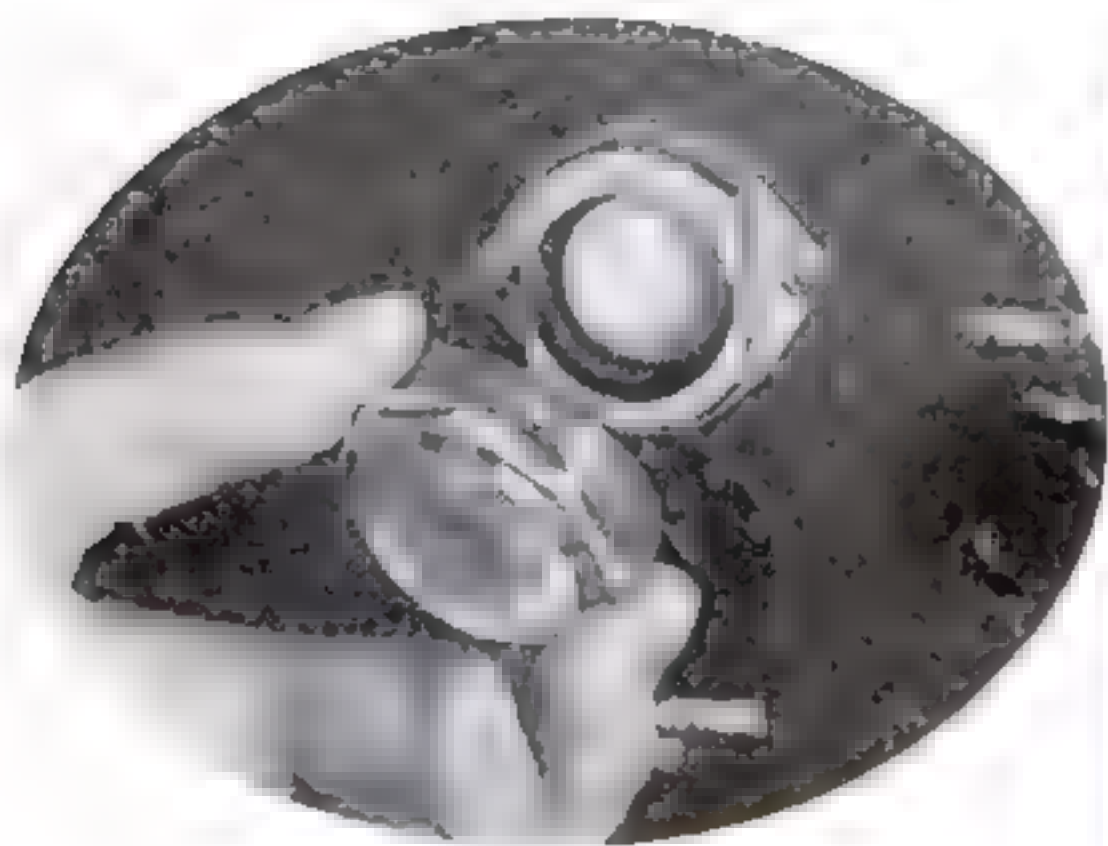
All the parts should be mounted on the



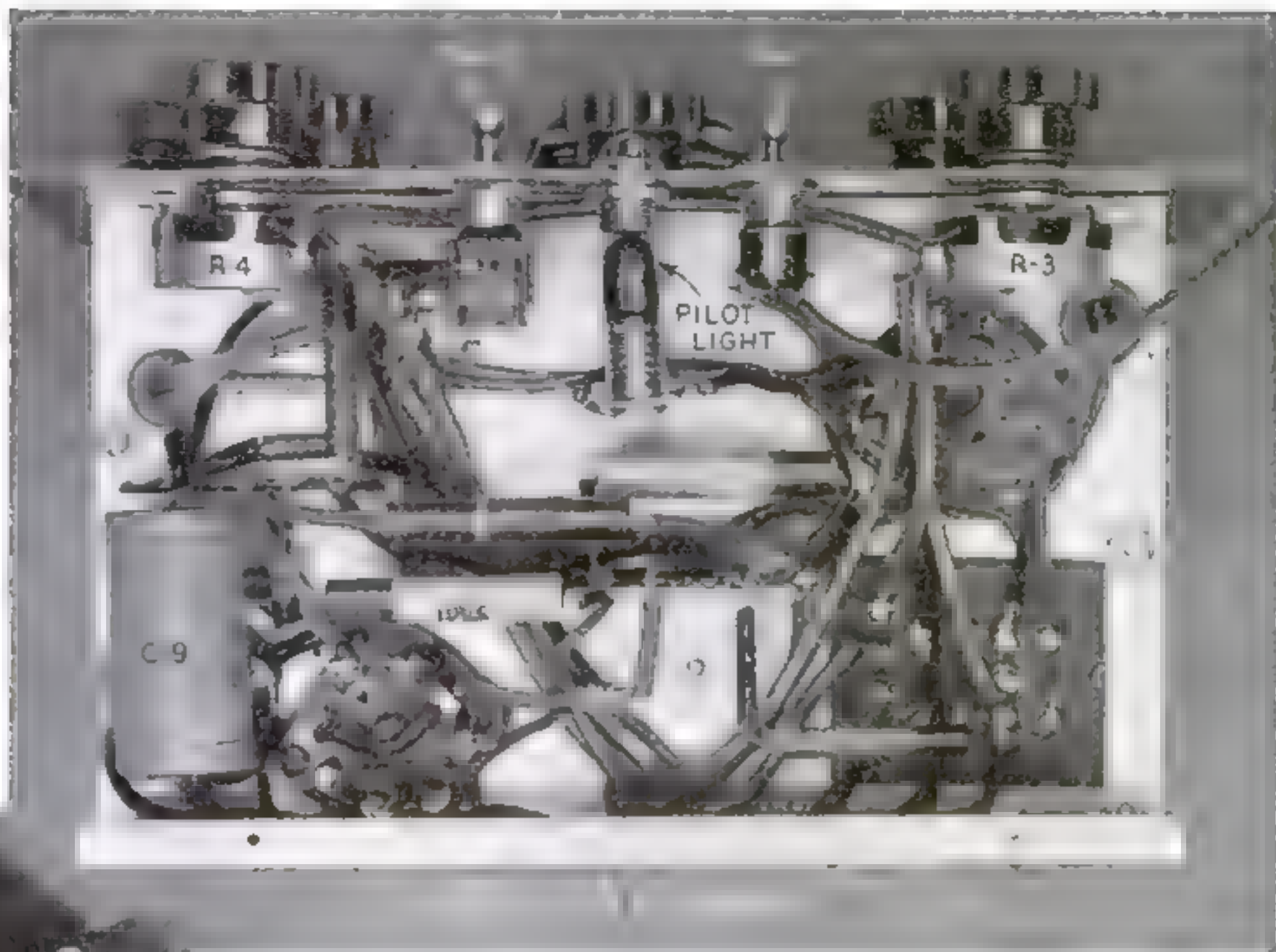
How the tiny cathode-ray tube produces electrons and focuses them into a beam which plays on the glass screen at the end



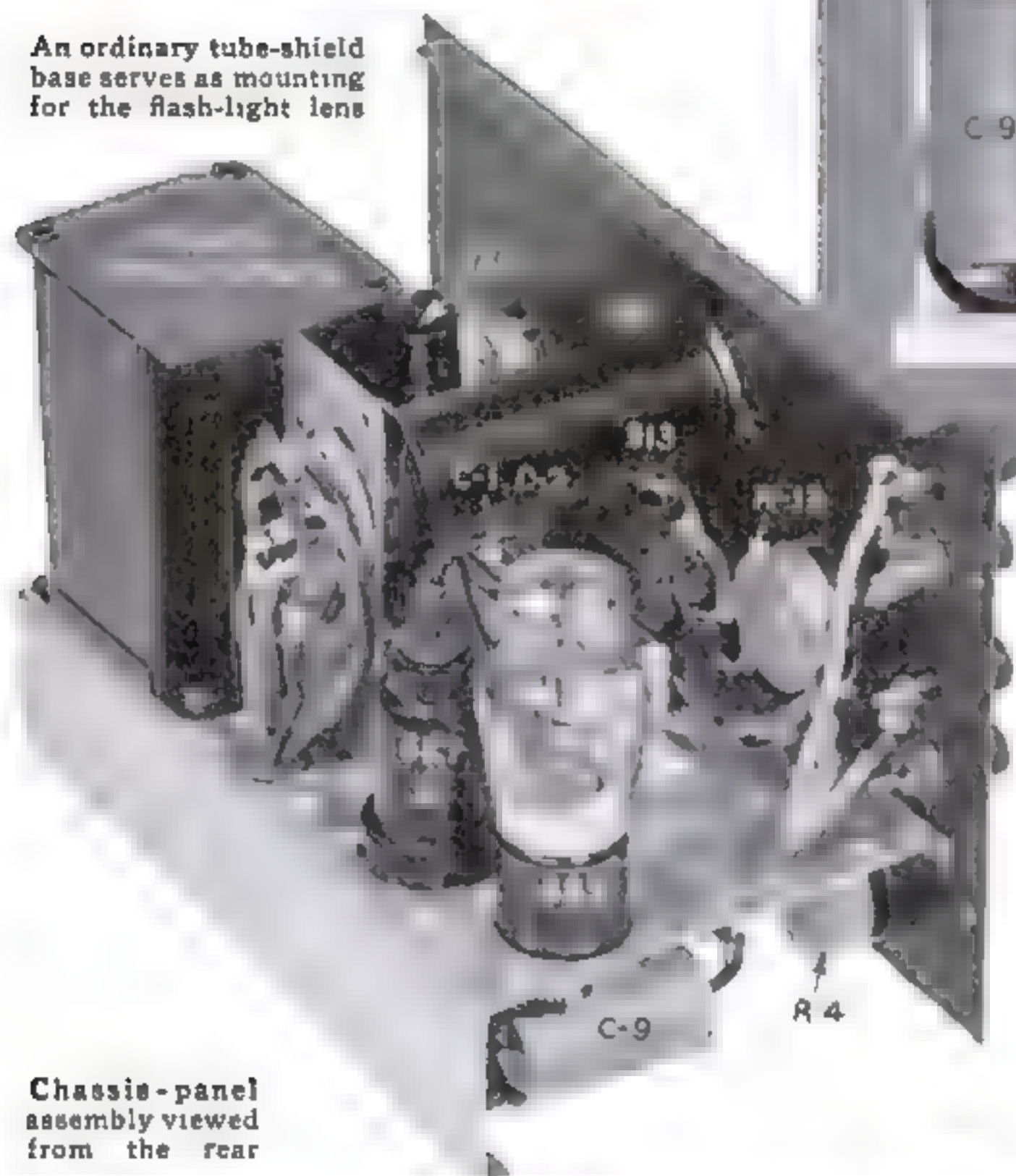
# Makes Sound Visible



An ordinary tube-shield base serves as mounting for the flash-light lens



Under view of the chassis, to show the wiring and placing of fixed condensers and resistors. The chassis is bent from a piece of sheet aluminum



Chassis-panel assembly viewed from the rear

combination chassis-panel unit before the actual wiring is started. In making the connections, start with the heater circuits of the tubes. Take care that the proper windings on the power transformer are used, and note that only the cathode-ray tube (913) connects to the winding marked 6.3 v., .6a. Also, make certain that the terminal No. 2 on the

913 connects to the junction of resistors  $R_3$  and  $R_4$ .

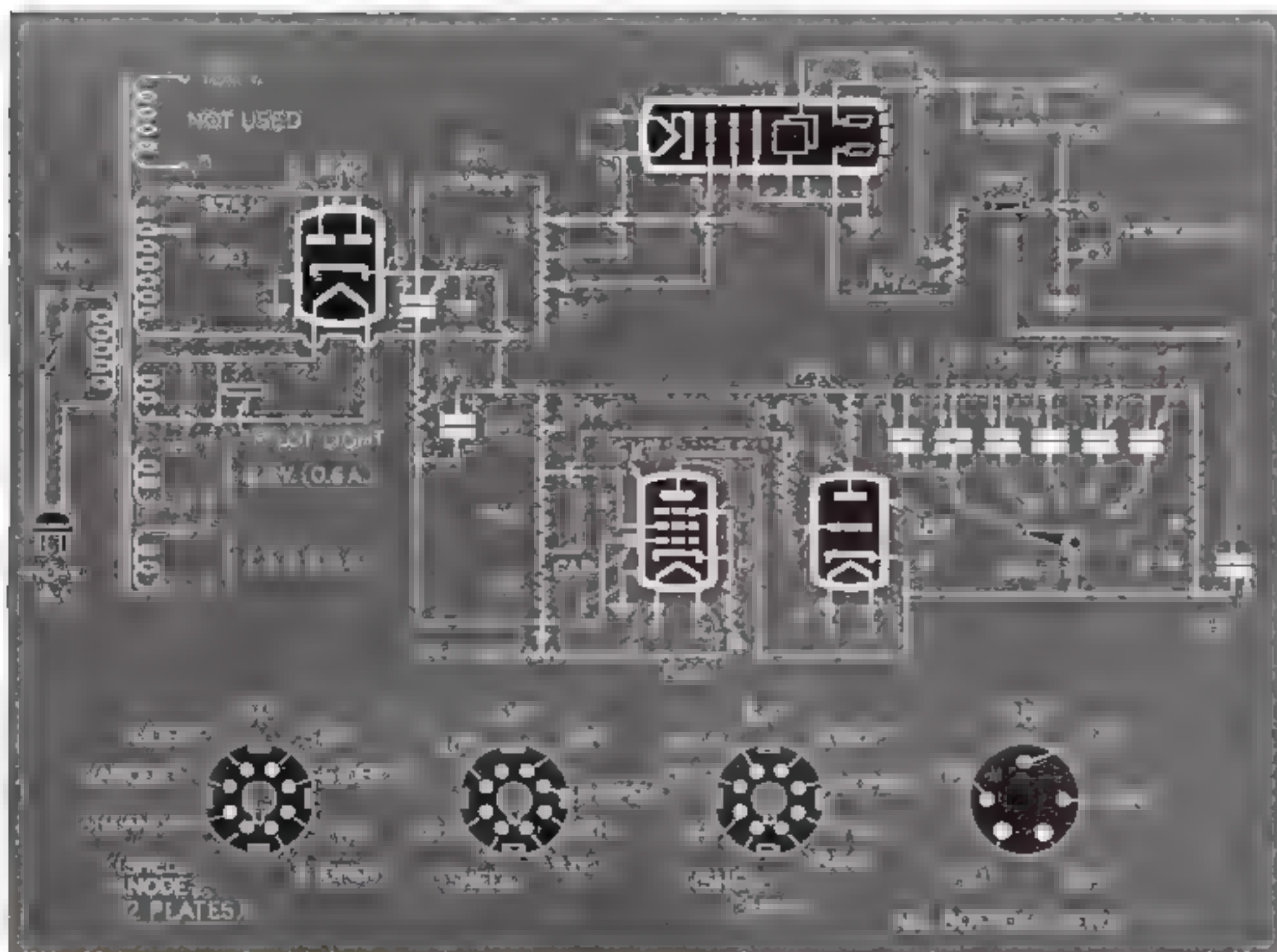
In assembling the power supply, the positive side must be grounded. This causes no complications whatever, but is mentioned since in radio work it is the usual practice to ground the negative, and not the positive, side of the circuit. Do not ground any of the heater circuits.

As shown in the photographs, the chassis is mounted in a five by six by nine-inch steel cabinet, the panel serving as the front. A small leather handle bolted to the top of the cabinet allows the unit to be carried easily.

To enlarge the image formed on the screen of the cathode-ray tube, a flash-light cap and lens can be mounted over the viewing hole in the front panel. A lens cap from the diffusing type of flash light should be used. A tube-shield base bolted to the panel will provide a means for fastening the flash-light cap in place.

When the wiring is completed and has been carefully checked and double-checked, the oscilloscope is ready for its first test. With only the 6X5 and 913 tubes in place, turn on the power and allow for the usual warm-up period. Then slowly adjust the focus control ( $R_3$ ) and the intensity control ( $R_4$ ) toward maximum until a faint green pattern is visible on the screen of the cathode-ray tube. Adjust the controls slowly until a tiny green spot about a thirty-second of an inch, or less, in diameter appears. Under no conditions allow the spot to become larger than this, or it will burn the screen.

When the spot has been carefully focused, turn off the power switch and put the 885 and 6K7 tubes in place. After the warm-up period, turn on the "sweep switch" ( $SW_2$ ) and adjust the "horizontal range con- (Continued on page 128)





"Told you it would boil!" snorted Selden, as he stopped the car at the top of the hill and got out. "Let me try it," Gus suggested, walking around to the driver's side



*Gus  
gives some*

# Tips on Economical Driving

**J**UST a bunch of boulevard buggies, that's all these new cars are!" Art Selden grumbled disgustedly, as he climbed out of his mud-covered, late-model sedan in front of the Model Garage.

"Not so good as a mud turtle, eh, Art?" smiled Gus Wilson, mechanic and half owner of the establishment, as he eyed the heavy load of sample cases in the back of the hardware salesman's car.

"Wish I could take the fellow who sold me this bus over part of my route through the mountains," Selden growled. "He bragged about what a good cooling system it had, and it boils like a darned teakettle before I can get to the top of a lot of those long mountain pulls up mud roads."

"Humph!" grunted Gus. "How about showing me what it'll do on the back trail up Oakes Mountain? That's only a couple of miles from here."

"Hop in," Selden snapped. "I'll show you, all right!"

In spite of the sticky mud and the deep ruts, the motor managed to keep the heavily loaded car up to twenty miles an hour on the stiff, two-mile upgrade.

"It's got the power, all right," Selden admitted, as they reached the halfway point. "Always had to shift to second at this spot, with the old bus."

Just before they reached the top, the dash thermometer reached the danger point and a cloud of steam floated out behind them.

"Told you it would!" snorted Selden, as he stopped the car and got out. "What's the matter with the cooling system?"

"Let me try it," Gus suggested, walking around to the driver's side of the car.

"Think you're a better driver than I am, do you?" Selden jeered. "Bet you a cigar it boils for you, too."

They rolled down to the bottom of the hill and started up again. When the temperature gauge crept up too high, Gus shifted quickly into second gear and opened the throttle enough to maintain the same speed. In a few seconds the thermometer started down again, and by the time they reached the top it was only slightly above the normal running point.

"I can do with that smoke right now," Gus grinned.

"You win it fair enough," Selden agreed, as he fished out a fat cigar and handed it to the veteran mechanic. "But I still don't see why it should work that way. I should think that the faster the motor turned over, the more heat it would generate, and in second gear it would boil quicker than in high."

"You forget that the fan and pump work twice as fast in second," Gus explained, as he bit off the end of the cigar and searched his pockets for a match. "And, while the motor is turning over twice as fast, the explosions in each cylinder are weaker, so that the net effect is better cooling in proportion to the heat developed. The only reason your old car didn't nearly blow the cap off the radiator on this hill is that you had to shift. You're not going to blame the new bus because it's got more power, are you?"

"Of course not, Gus," Selden replied. "Thanks for the tip. There's a lot of things I don't get the hang of yet, in this driving business. And I ought to know all the

tricks, because, working on commission as I do, every cent I spend on the car comes right out of my pocket."

"You're not the only one in that fix," Gus laughed, as they headed back for the Model Garage. "When a man neglects his car, nobody will waste any sympathy on him if his repair bills are big. But I do feel sorry for the fellow who is trying his best to keep his car right, and mistakenly goes to a lot of trouble to do things that do the car more harm than good."

"Tell me some of them," Selden suggested. "Maybe I do them, too."

"Well, for example," Gus began, as they climbed out again in front of the Model Garage, "how often do you fill the radiator?"

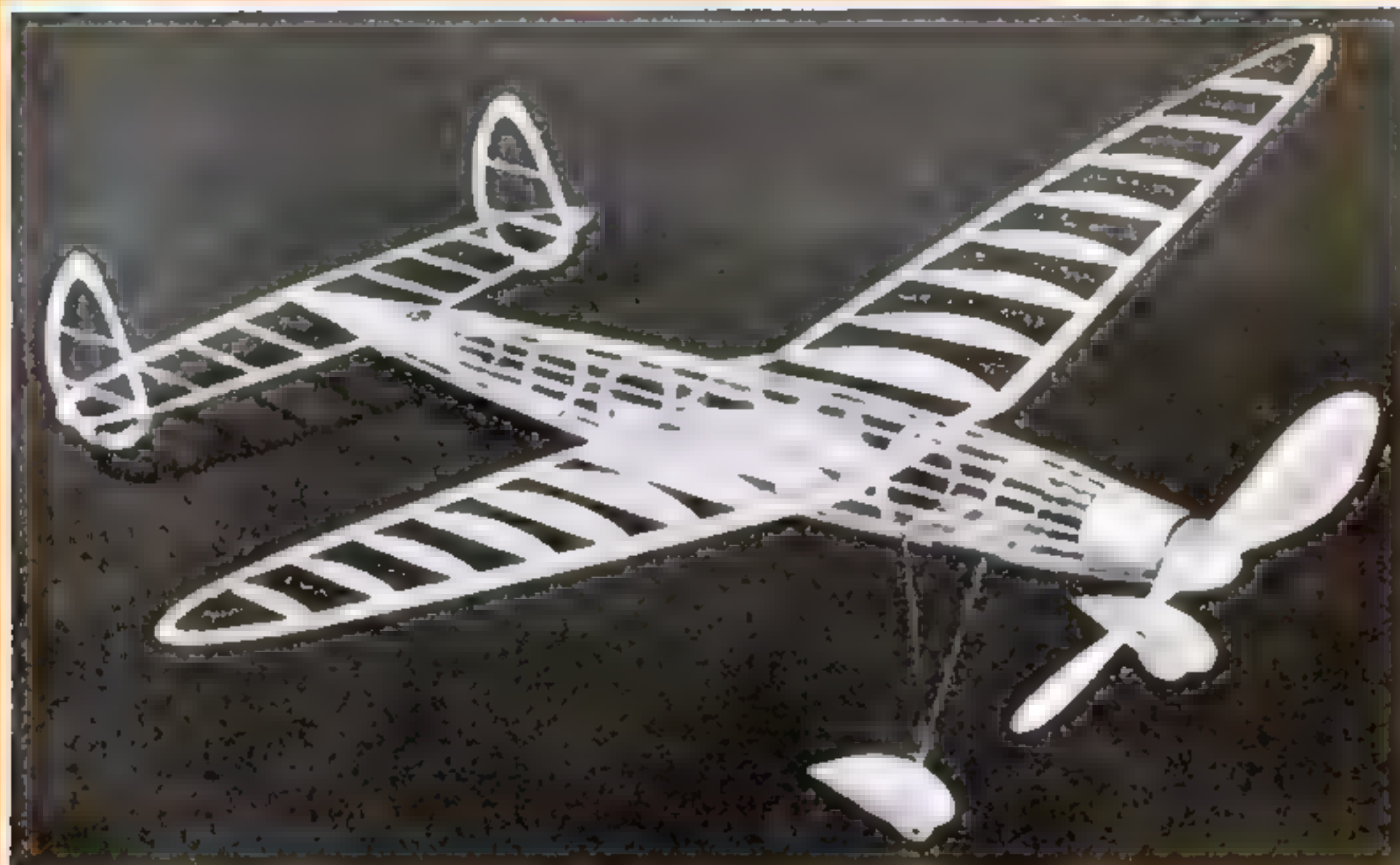
"Every time I get gas," Selden replied. "Surely, keeping the radiator filled is a good thing, isn't it?"

"That depends on what you call filled," Gus explained. "There's no sense in filling the radiator right up to the brim every time you get gas. If there is no leak in your cooling system, you don't lose any water to speak of for months at a time, unless the motor boils over. Now, if you just recently filled the radiator up to the brim, the chances are that only the excess water has been forced out since then. In that case, filling it again is bad practice. Every time you put in more water, you put in more dirt, unless the water is distilled or exceptionally pure. Traveling around, the way you do, you're likely to run into plenty of sections where the water has chemicals in it that form lime deposits in the radiator. The best way is to fill the radiator only when the level is actually below the normal running point—and if there is (Continued on page 124)

By MARTIN BUNN



# THE HOME WORKSHOP



Framework of the model, the wing span of which is 24 in. Note how close the wing is set to the line of thrust, which runs through center of fuselage

Designed  
for rough weather,  
the "Utility Special"  
has remarkable speed,  
stability, endurance,  
and strength

By  
**FRANK ZAIC**

Editor of  
*Model Aeronautics Year Book*

## THIS NEW Flying Model WON'T CRACK UP

**S**PEEDY and extraordinarily stable, this new streamline model airplane, known as the "Utility Special," is a fine design to open the season's flying. On normal power it will average flights from half a minute upward, and by the addition of a few extra strands of rubber it can be made to buck stiff winds or fly at racing speed. The materials cost about 50 or 60 cents.

**Fuselage.** Laminate 1/64-in. balsa sheets for the entire set of bulkheads. When the cement has set, tack each bulkhead to a drawing board and mark the outline, longeron slots, and stringer marks. Trim and cut the slots with a razor.

Select four matched longerons. Mark the bulkhead spacings while all are held together. Cement longerons to bulkheads 4 and 5. Let the cement set well. Then cement the rest of the bulkheads, working from center towards ends. Keep the fuselage lined up. The 1/16-in. square stringers are next cemented so that they are superimposed above the marked points on the bulkheads. Trim longerons flush with front bulkhead, and cement an extra

sheet without slots in front of them. In rear, trim longerons and stringer to a point, cement them together, and cut off slightly to accommodate trailing edge of stabilizer. The 1/64-in. sheet covering is applied after stabilizer and front plug are made.

**Landing Gear.** Make the laminated platform and cement to bulkheads and stringers. Cut and bend the wire struts. Cement them to the platform and reinforce with wire staples. After the cement has set, the lower wire extremities are bound together very tightly with rubber bands. The streamline "pants" are made by cutting the sides and center to shape and cementing them together. Standard hardwood wheels are used. Set the pants parallel to the fuselage and fasten them to the wire with a generous amount of cement. To line up landing gear, cement a long strip of balsa on top of the center longerons just in front of the bulkhead and measure up from table to each end. Keep the strip in place to check the wing and stabilizer during the later assembly.

**Wing.** This is built in one piece, but



The stabilizer also is on the center line, and the rudders extend above and below it. Every feature has been planned to give utmost efficiency



the center or flat portion is made rather loosely as it has to be taken apart and reassembled on the fuselage. Draw a full-size plan. Cut all ribs to same size, and shape the leading and trailing edges. Now superimpose the spars over the full-size drawing and hold them with pins while the ribs are tapered and cemented. Note that the spars are cut in three sections. Use cement generously while placing ribs. Be sure to shape tips well to reduce drag.

The dihedral angle is made by raising the wing tips  $2\frac{1}{8}$  in. and beveling the center and the outer-panel spars at their junction to the correct angle for a butt joint.

Separate center section of wing from the assembly and let one rib hold the spars to correct spacing. Pass the spars through the fuselage stringers and cement the front spar to bulkhead 4. Make certain the spars are parallel to the line-up strip. Replace the rib, and also cement the ribs which nestle against the fuselage. The outer two panels are joined to the center section. Check the dihedral by noting the distance from tips to table; also correct any difference in incidence. If you are doubtful of the cement, strengthen the joint with a bamboo sliver. Cover top of center portion with stiff writing paper, and cement the corner fillets as shown.

The rudder outline is cut from 1/16-in. sheet, as are the stabilizer wing tips. The stabilizer is made in one piece with a temporary center joint, which has to be broken and recemented when the stabilizer is inserted behind bulkhead 10 and below the center longerons. Note that the trailing edge continues the fuselage line, and that



The ornamental white outlines are cut from stiff writing paper, and the dark portions are colored with lacquer, which gives a smooth, glossy finish

the longerons and stringers butt against the inside of this spar. This setting provides the needed negative adjustment. The rudders are cemented to the stabilizer after the stabilizer is covered.

**Propeller and Nose Plug.** Cut the propeller blank from a piece of hard balsa. The blades are very wide and set at low pitch to produce a powerful forward thrust with minimum torque. The spinner is an integral part of the propeller. The front portion is cut and recemented after it is hollowed out and the free-wheeling device cemented in place.

The propeller is carved by finishing the top camber first and then cutting the lower camber, which is about  $\frac{3}{32}$  in. deep. Give the blades a definite airfoil section.

The final touch is to "dope" and sandpaper the blades. To give extra strength, cover the propeller with paper. Notice that a piece of aluminum is cemented on the back of the propeller to form a dust-free receptacle for the ball-bearing washer.

The nose plug is made as shown. The front and rear aluminum plates have crimped edges to provide more cementing surface. The rim is 1/64-in. sheet balsa. Be sure the plug fits snugly in the bulkhead and is flat against it.

**Covering.** The front and rear balsa coverings are now cemented. On the front, the longerons and stringers are cut in 1/64 in. to form a smooth continuous surface after the sheet is cemented in place. Note the overlap over the nose plug. The opening in the rear for the insertion and removal of the rubber is cut with a sharp razor. When the trimming is completed, coat the edges with several coats of cement.

The best way to cover the model is to follow the Bunker system, which

makes use of moist paper. Cut the paper to cover as much as possible without interfering with extruding parts. Place the paper on a cloth and spray it with a fine mist until moist. Brush a thick coat of dope on the extreme longerons which the paper can reach. Take the sheet in both hands, line up for the center, and press the paper onto the fuselage. Wing and tail are covered so that the grain of the paper is spanwise.

Spray with fine water mist to remove creases and wrinkles. When dry, dope the entire model with regular model dope.

The color scheme used on the original model is yellow paper with red lacquer trimming. The balsa can be finished by doping several times with intermediate sandings, and finally lacquering.

**Flying.** The initial power is six strands of  $\frac{1}{8}$ -in. flat rubber, placed by stringing it through the fuselage with a string.

Check the center of gravity, which should be about  $\frac{1}{4}$  in. behind bulkhead 5. If it is off too much, correct by adding modeling clay to the appropriate side. Now place the model on a smooth floor, raise the tail until the fuselage is parallel with the ground, and give it a straight-forward shove. A correctly balanced model will rise a few inches and make a long glide. Any stalling and sharp-turning tendencies should be checked before making further tests. Now stoop and glide the model a few feet above the ground. Correct disturbing tendencies. Next glide from shoulder height.

If everything seems all right, wind the model about 100 turns and let it take off the ground. It should rise up a few feet after a moderate run. When power slackens, it should assume a good gliding position. Correct excessive torque banking by giving the left wing a slight wash-in, and warp the rudders for a right turn. Keep on increasing the number of turns.

The model is now ready for geared-winder turns. The rubber is wound by inserting an S-hook between the rubber and the propeller shaft. Be sure to use lubricant and also remember to allow the rubber to have few inches of elasticity.

This design can be readily converted into a contest racer by reducing the area of the wing and stabilizer, by thinning the airfoil section, by substituting smaller and thinner wheels, and also by discarding the pants. The dihedral and the rudders can be the same size.



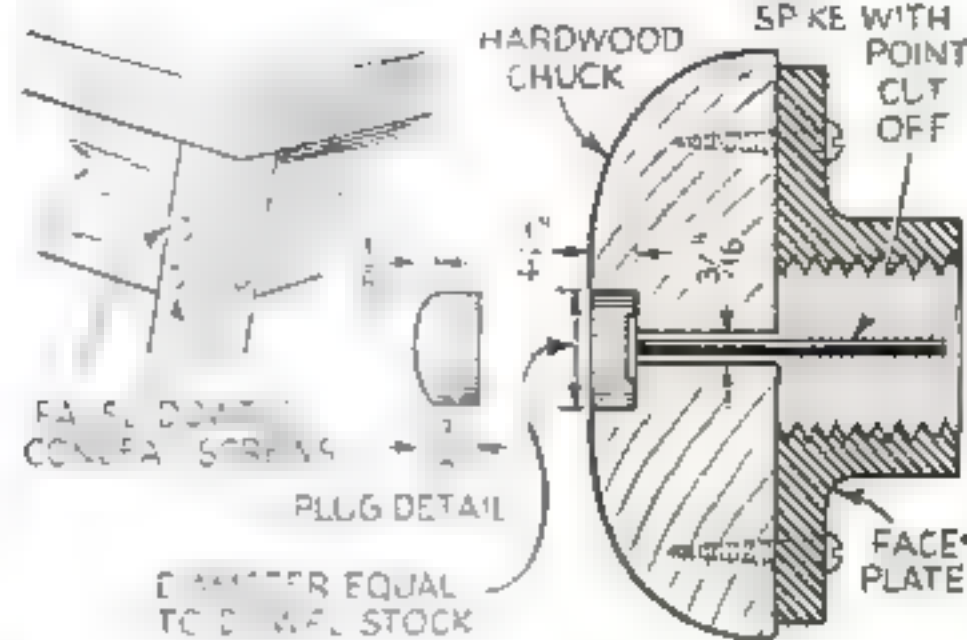
Ready for a rise-off-ground flight. Tested in a fresh breeze, the model gave flights from thirty-five seconds to a full minute





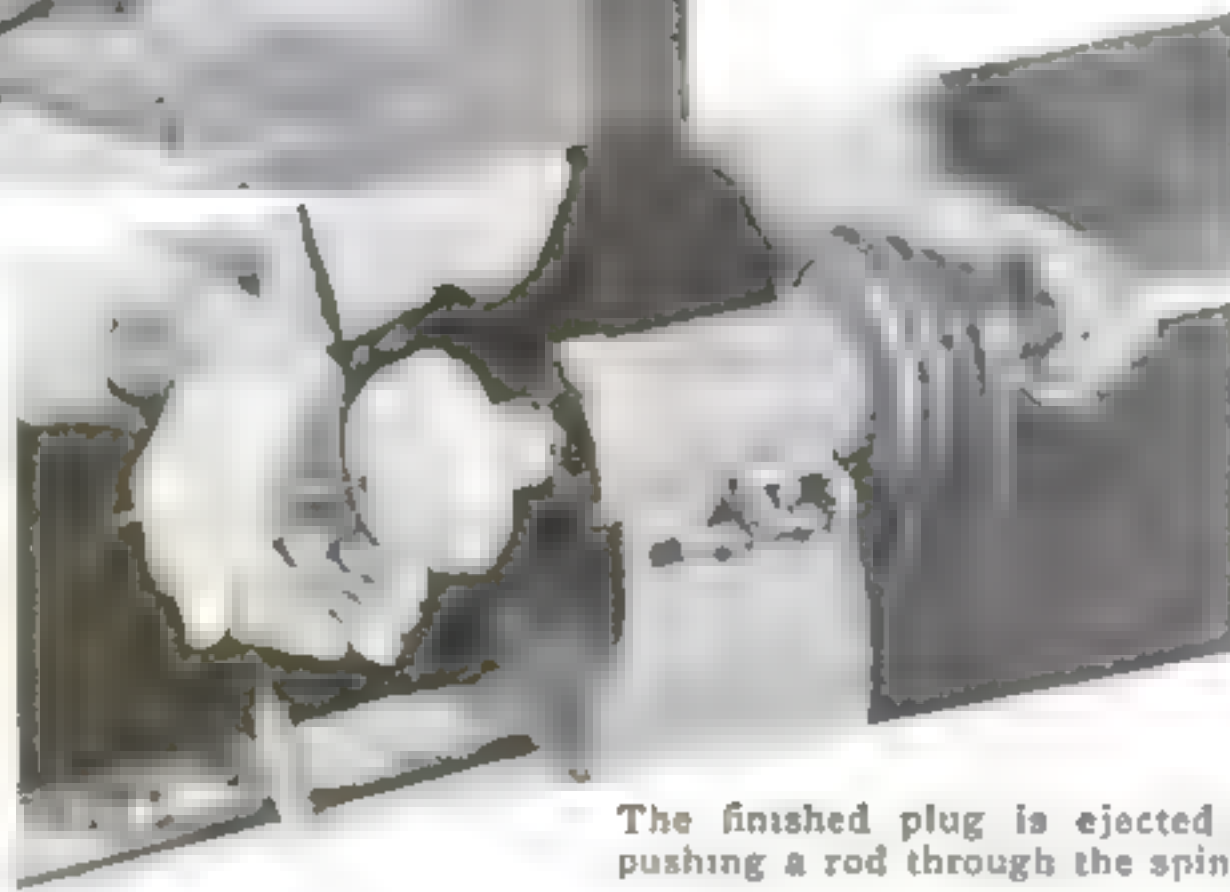


# Jig for Rounding Ends of Screw-Hole Plugs



Left: Roughing out a plug with a cabinet file. The drawings above show the jig and how the plugs are used to hide screws

A DECORATIVE, hand-made effect is often given antiqued furniture by means of projecting dowels, which appear to unite the parts. The joints are usually assembled, however, by sinking screws into counter-sunk holes and concealing them with plugs. The plugs can be obtained from large dealers, but amateur woodworkers make their own in most cases. Considerable time is lost in doing this unless a special method is employed. The writer found a lathe jig excellent for this work.



The finished plug is ejected by pushing a rod through the spindle

The jig consists of a hardwood chuck turned on a small faceplate and bored  $\frac{1}{4}$  in. deep to fit the dowel stock used for plugs. A  $\frac{3}{16}$ -in. hole is drilled through

the center for a knock-out rod—a spike with its point cut off.

To use the device, cut the dowels  $\frac{3}{8}$  in. long and pile them conveniently near the lathe. Screw the faceplate on the lathe, and tap in a plug with a cabinet file. While the machine rotates at its highest speed, rough the plug to roundness with the file by stroking forward and upward from the end, which tends to hold the piece in. Then smooth with two or three strokes of a mill file rocked from the outside to the center of the plug. After stopping the lathe, push a piece of dowel stick through the spindle to press the nail end, which in turn will expel the finished plug.

Counterbore the screw holes  $\frac{1}{4}$  in. deep, allowing for a  $\frac{1}{8}$ -in. projection of the rounded plug ends.—E. M.

## WHAT TO DO IF A CIRCULAR SAW FAILS TO CUT SMOOTHLY

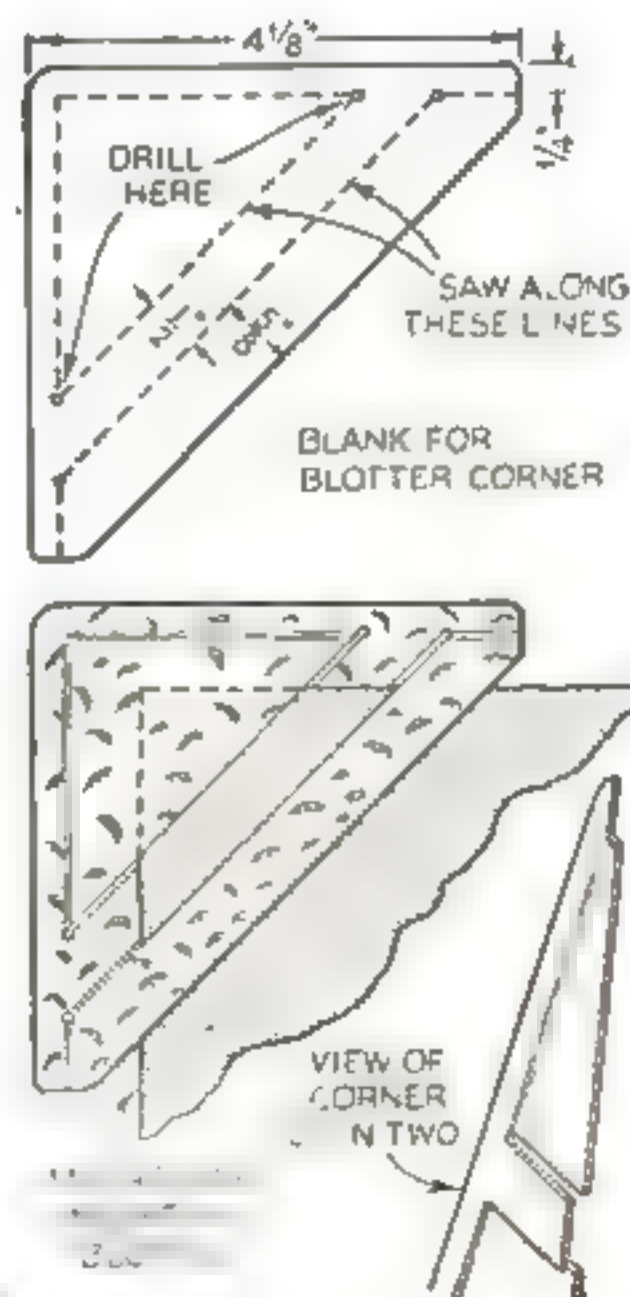
WOODWORKERS who have difficulty in cutting smoothly on their circular saws should first make sure the blade is properly filed and set, then check the fit of the blade on the arbor. If the hole is too large, put the blade flat on a block and, using a smooth-end nail set or punch, carefully tap all around the hole about  $\frac{1}{32}$  in. back from the edge on both sides. Keep tapping and trying blade until it fits right. Joint teeth and file saw again.—MOYER WOOD.

## BLOTTER CORNERS FOR A DESK PAD

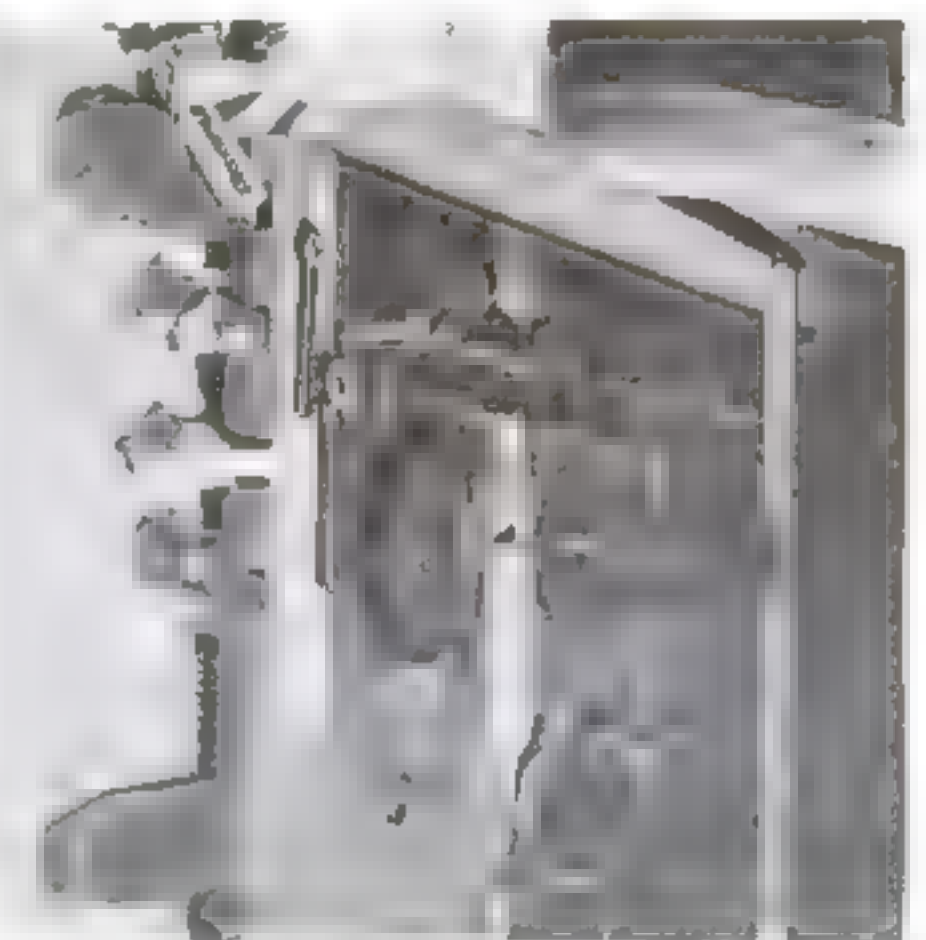
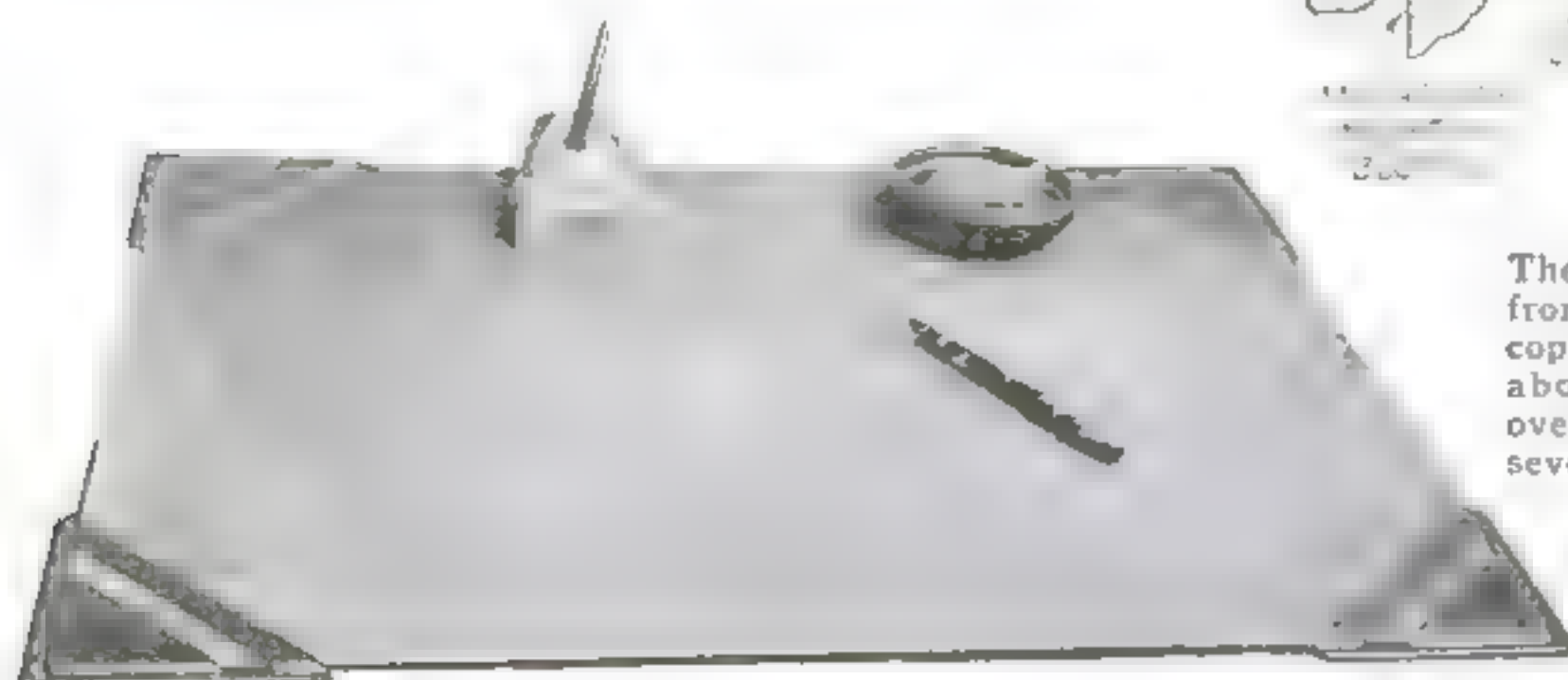
BLOTTER corners of the type illustrated do not require a desk pad, but are merely slipped over the corners of two or three desk blotters.

Either brass or copper about .020 in. thick may be used. Cut the pieces as shown and hammer them, if desired. Drill small holes where indicated to admit a jeweler's saw blade, and saw between them to form the back strip which goes under the blotters. Then draw a line  $\frac{1}{4}$  in. in along the outer or right-angled edges of the corner. Set the piece in the vise flush with one of the lines and use a punch with a flat end to raise the end of the front strip and the corner itself about  $\frac{1}{16}$  in. Turn the piece around and repeat along the opposite edge. Take care not to stretch the back strip any more than can be helped or it will buckle.

When the four corners are completed, polish and lacquer them. If thought necessary, the metal may be covered with felt at the points where it comes in contact with the desk top.—D. H.



The parts are made from thin brass or copper as indicated above and slipped over the corners of several desk blotters



## VERTICAL RACK KEEPS TOOL HOLDERS HANDY

Tool holders for use in a lathe have to be changed frequently even on the simplest work and should be kept handy. When they are placed in a horizontal rack, however, the sharp ends of tool bits left in them are sticking straight up in such a way that you may injure yourself. After trying a number of methods, I finally put up a strip on the side of the rack with slots just large enough to fit the shanks. The strip is made from a  $\frac{3}{4}$ -in. board about 2 in. wide and as long as necessary, with slots 2 or 3 in. apart. Incidentally, this type of rack conserves space.—B. K.





The final rubbing is done with crude oil, FFF pumice stone, and pads or blocks of felt

# How to Finish BOOK ENDS

*and Similar Small  
Pieces of Craftwork*

By

RALPH G. WARING

**R**ECENTLY I discovered in storage, two six-inch wooden models of the St. Gauden's eagle—the ones with the "pants" as a much-disturbed artistic group in Washington, D. C., called them at the time that famous artist made his coin designs about 1907. They were just what was needed for book ends to stand on either side of a genuine bronze lamp on my desk. But how to make them look like metal?

First, I made maple base blocks and fastened on 20-gauge aluminum book extension plates, covered with brown pool-table felt.

Bronze, weathered and polished by time and handling, is essentially deep walnut in tone, so a standard 4-oz. water stain of this color was applied evenly. This was allowed to dry three hours. Oil or spirit stains are not suitable for this work because succeeding coatings would tend to dissolve and lift the color.

Next, the pieces were given a thin

and even coat of brushing lacquer applied with a 1-in. soft bristle brush of the fitch or bear type. After drying hard, the entire surface was rubbed with a piece of cotton duck canvas in lieu of sandpaper.

To see what antique bronze or copper looks like when exposed to the weather, look at the copper dome of your courthouse or the copper flashing on some roof or store. The color is really a very light gray, shaded green over deep brown. Get a quarter-pint can of jade green four-hour enamel and a similar can of white; then mix two parts of green with one part of white. A teaspoon or two will be ample. Use any brush or even a rag to apply this

deeply into all portions, and use a clean, soft cloth to wipe off as much as you can, leaving about seventy-five percent of the brown exposed.

In following this method, the head, wing shoulders, and other high-lighted portions were wiped clean; then the base was stippled with enough color from a crumpled rag pounce to give the desired effect, and the two pieces were set aside to dry. By using brushing lacquer first, then the color enamel, the latter can be wiped clean without cutting into the clear base lacquer. Enamel over varnish would not be successful. Shellac could, however, be used in place of lacquer, but would not be as durable. (*Continued on page 111*)

Although they look exactly like much-handled and beautifully aged bronze, the book ends at right are really carved wood

Below: Hold the book ends when varnishing them so that all exposed surfaces may be coated without touching the wet varnish



The maple veneer used on the curved profile of one set of book ends and all the maple base pieces are bleached with a common chlorine antiseptic



Pair of book ends designed to harmonize with furniture of Colonial style. They are veneered on the face with American walnut burl, on the back with an unfigured piece



# YOU'LL BE WELL REPAID IF YOU BUILD THESE Three Fine

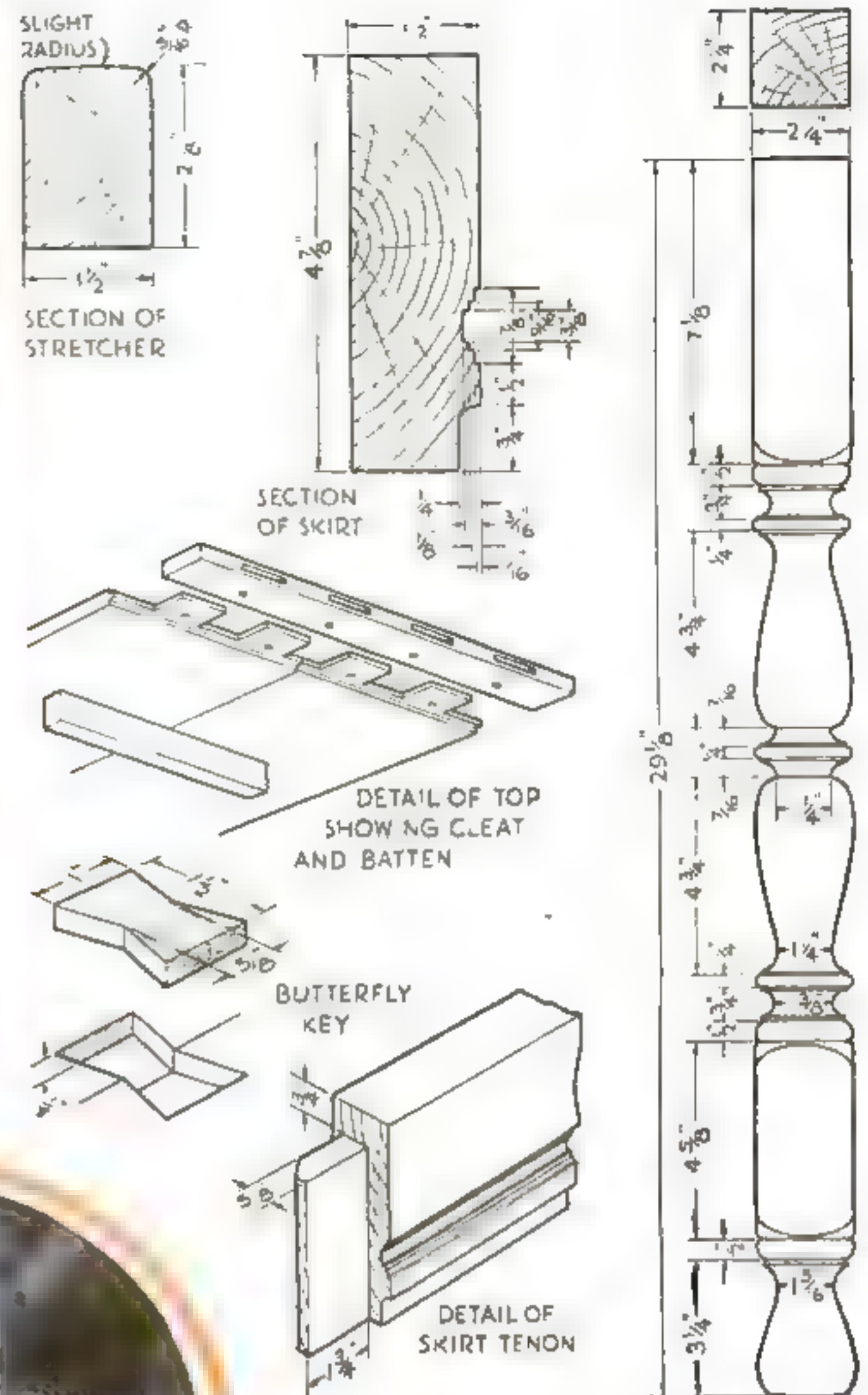
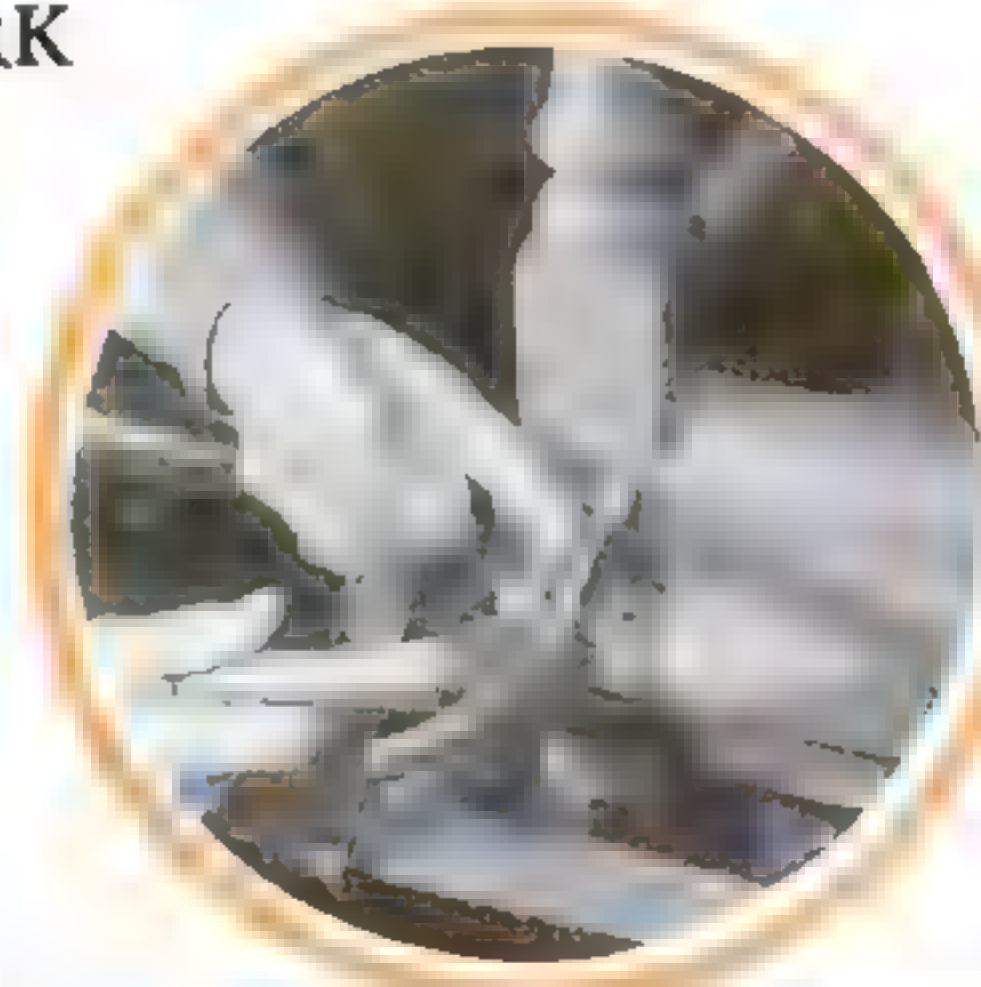


## MAPLE LONG TABLE REFLECTS BEST COLONIAL WORK

**L**IKE many other modern names for furniture in the antique style, the term "tavern" commonly applied to the table illustrated is not the one our forefathers used. Its style is of the years around 1690-1710, and in the inventories of the period it was variously known as a long table, a joined table, or a standing table. Nowadays it finds a place in the library or small dining room.

The molding on the skirt is easily made by running the pieces through a circular saw to the required depth at the different points, roughing out the large cove with a gouge, and finishing with sandpaper. The outer faces of the skirts and stretchers are set even with the outer faces of the legs. This is known as "flush construction" and is, and always has been, the mark of good joinery. Since the mortises in the legs meet and *all* of the hole should be filled, the ends of the tenons on the skirts and stretchers should be beveled as shown.

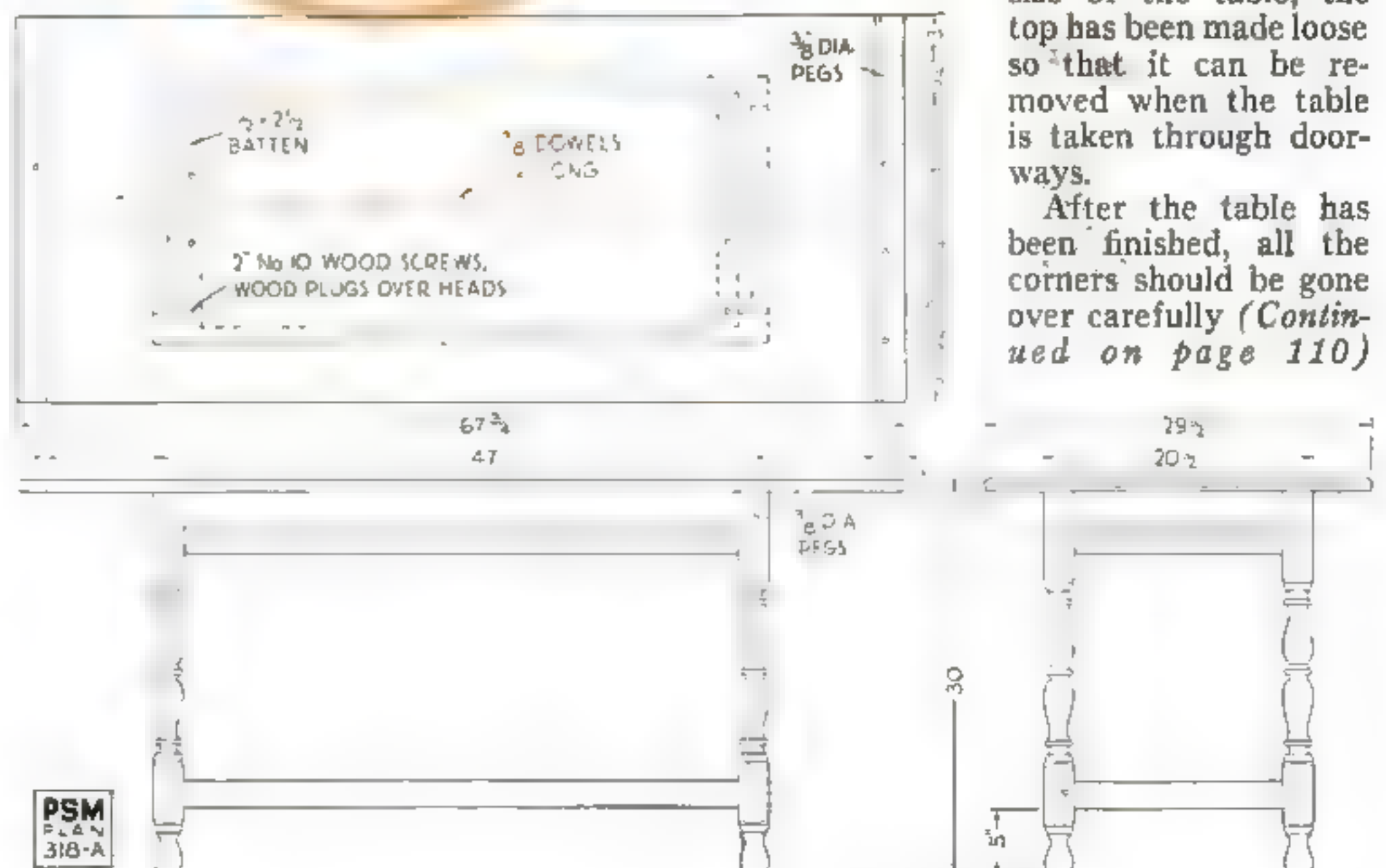
The two boards for the top should be matched along the inside edges and then doweled and glued. The butterfly keys should be cut somewhat thicker than the finished dimension so that they can be easily removed during the process of fitting. The edges should be slightly tapered; then the outline should be scribed on the surface of the table at the joint and the recess cut with a sharp chisel, making sure that it is undersize. The key should be fitted by alternately shaving the sides of the hole and driving the key into it. When the key is finally home, it should be glued and clamped; and after the glue is dry, the excess material is planed off.



Details of principal parts and joints and, at left, the flush construction of skirt and leg

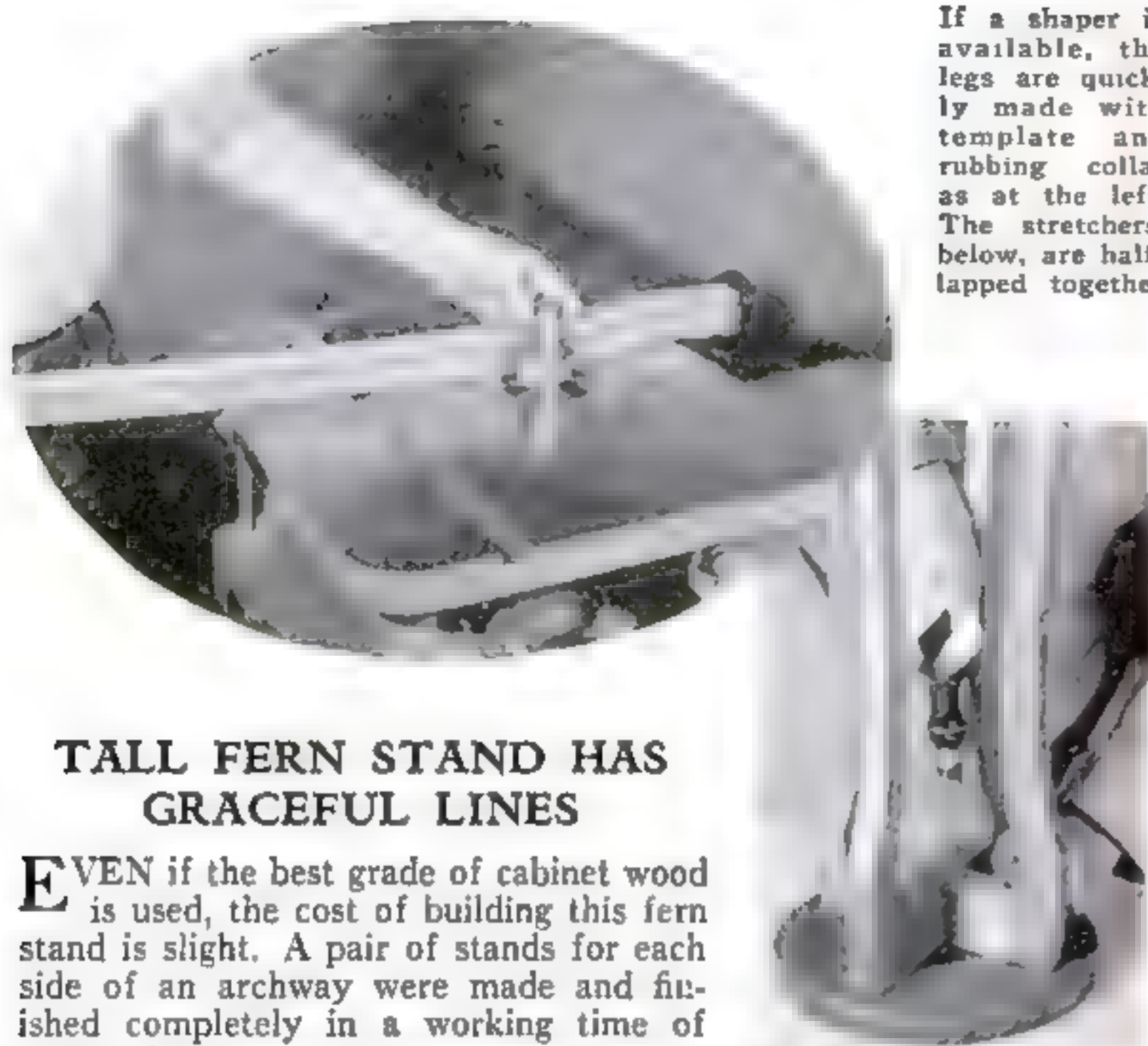
The method of cleating the ends of the top is peculiar to the tables that were made in Pennsylvania and is indicative of the finest construction. If it looks like too much work, the cleats can be fastened with dowels extending clear through and with their ends exposed. Because of the size of the table, the top has been made loose so that it can be removed when the table is taken through doorways.

After the table has been finished, all the corners should be gone over carefully (*Continued on page 110*)





# Pieces of Furniture



If a shaper is available, the legs are quickly made with template and rubbing collar as at the left. The stretchers, below, are half-lapped together

## TALL FERN STAND HAS GRACEFUL LINES

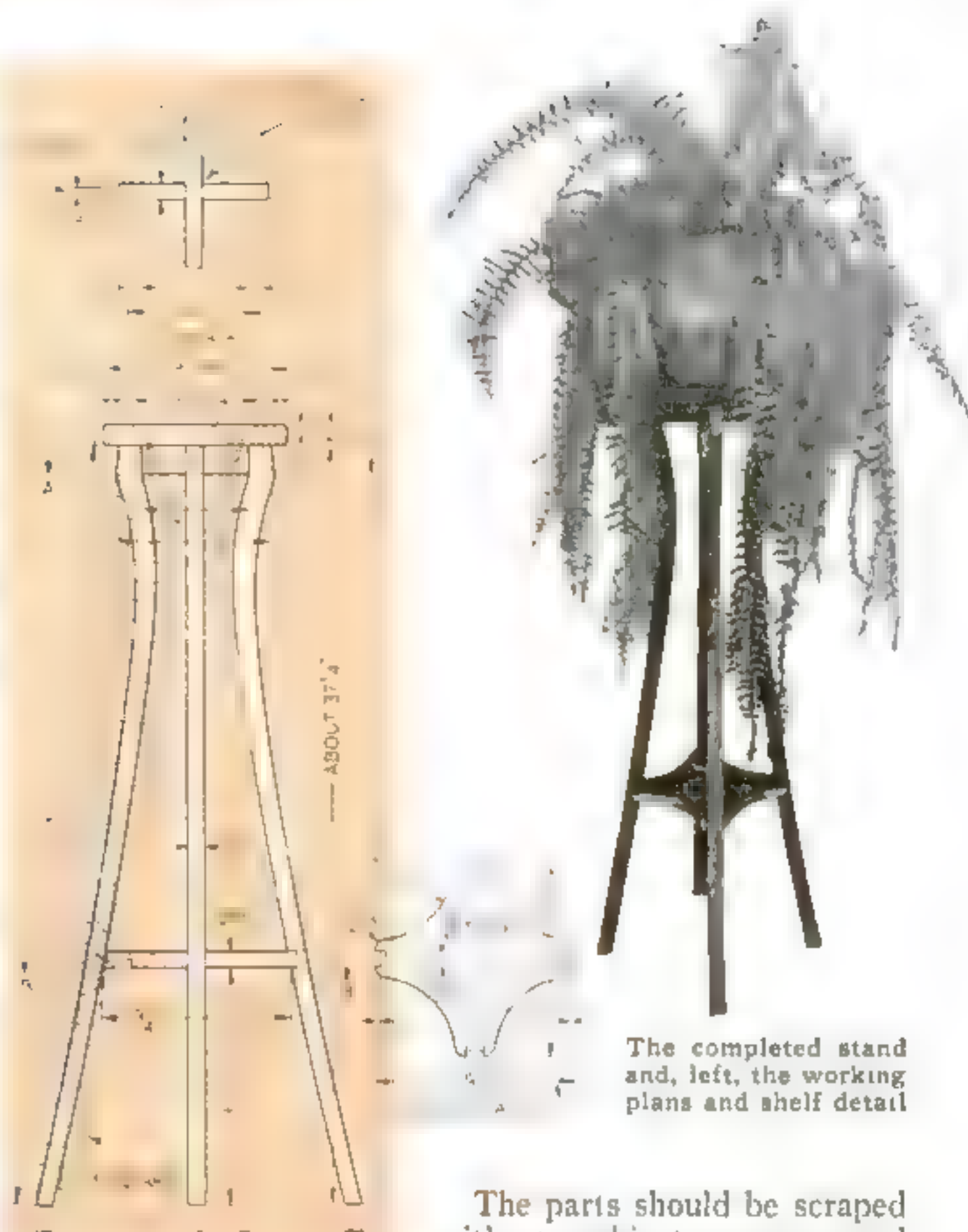
**E**VEN if the best grade of cabinet wood is used, the cost of building this fern stand is slight. A pair of stands for each side of an archway were made and finished completely in a working time of twenty hours.

The legs may be cut out on the jig saw, filed, scraped, and sanded to outline. However, if a vertical spindle shaper is available, a straight cutter and a collar of the same diameter may be used with a template. The outline of the leg should be laid out on birch or maple and cut to shape to serve as the template. Leave about  $\frac{1}{8}$  in. between outlines for sawing and shaping. Four sharpened brads projecting through the template will serve to hold the blank and form together when shaping.

A  $\frac{1}{8}$ -in. radius should be run on the corners of the legs except where they fit

in the shelf and at the top where they are mortised for the short cross stretchers. The stretchers, which are half-lapped at the center, are drilled and countersunk for screws into the top. Each pair of legs, after being sanded, are glued to their stretcher by the mortise and tenon joints.

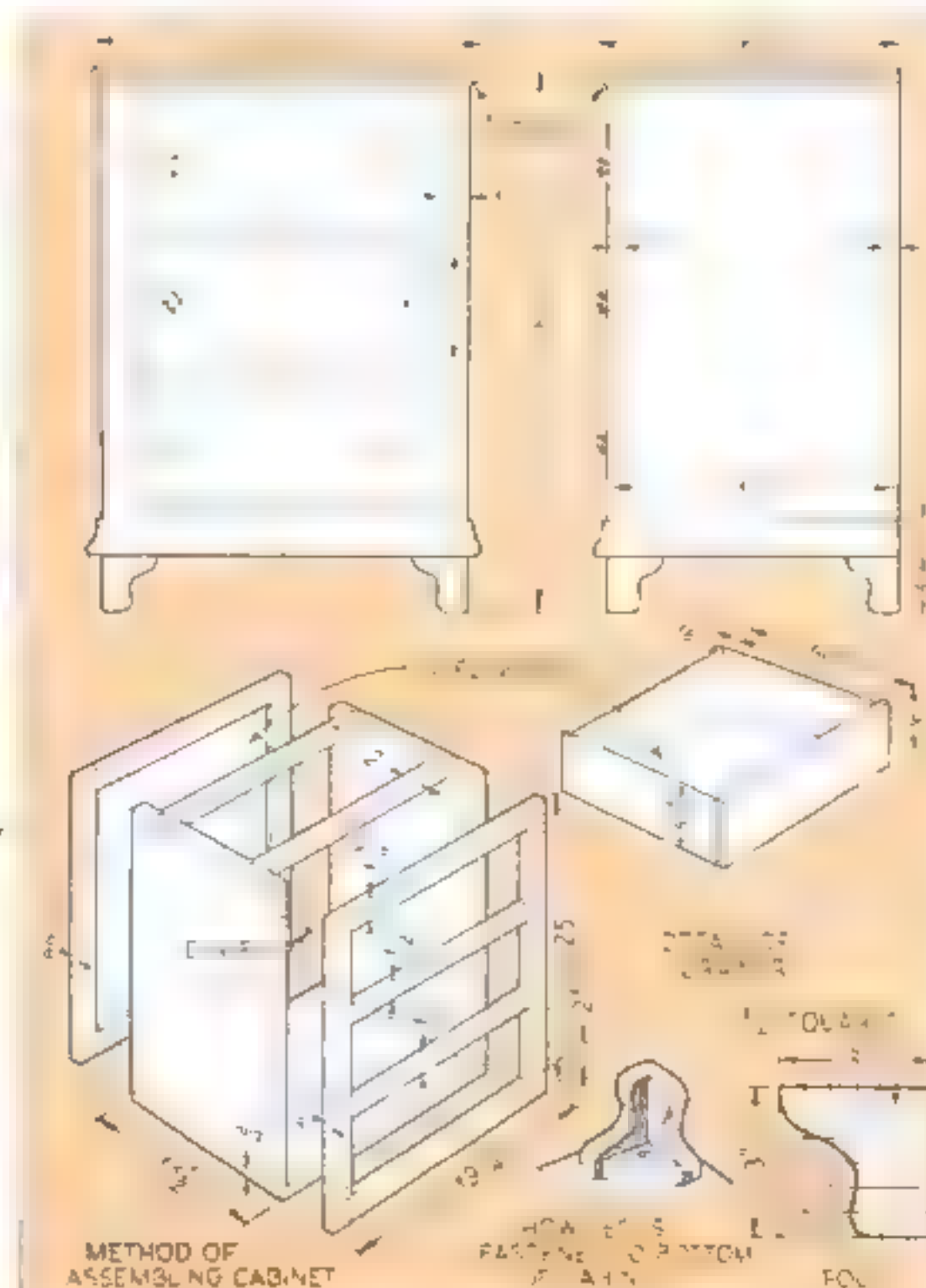
The top is turned on the lathe and recessed for the plant container. The shelf is jig-sawed or band-sawed.



The completed stand and, left, the working plans and shelf detail

The parts should be scraped with a cabinet scraper and thoroughly sanded. Then screw them together for a trial assembly, mark the parts so that you will be able to put them together again in exactly the same way, and take apart for staining, filling, and varnishing. A waterproof varnish rubbed dull is recommended.—DONALD A. PRICE.

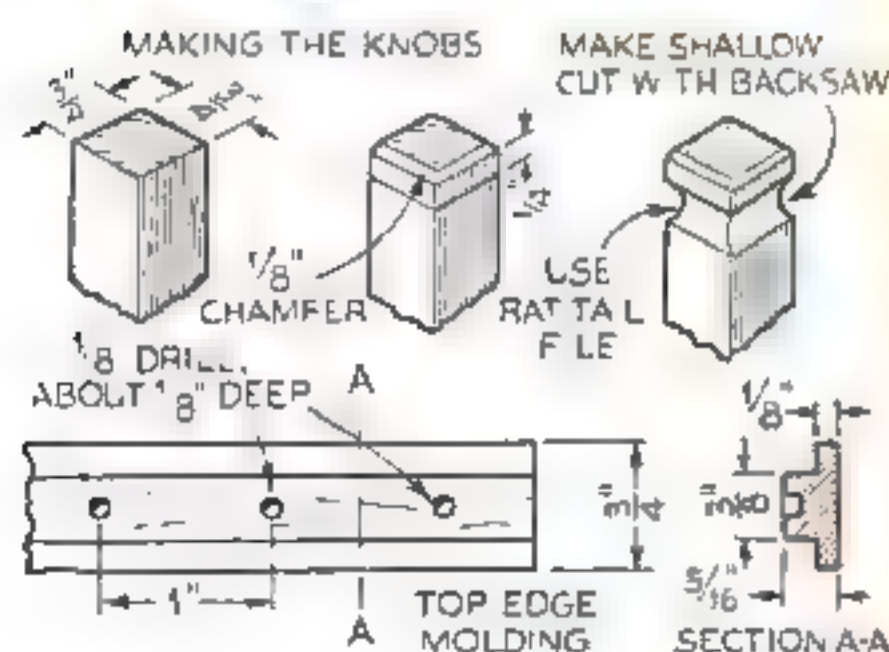
## SMALL CHEST SERVES AS BEDSIDE STAND



**T**HIS bedside chest is an ideal place for children to keep their clothing, or it may well be used as a night stand. The main parts of the chest are of mahogany; the drawer sides and backs, of yellow poplar; the drawer bottoms and the back panel,  $\frac{1}{4}$ -in. three-ply veneer. Make the two sides and the bottom first. The bottom is fastened to the sides with glue and  $1\frac{1}{4}$ -in. flathead screws. Next dovetail in the two stringers for the top support. Make the facings for the front and back as shown and fasten them to the body of the cabinet with dowel pins and glue.

The remainder of the construction is made clear in the drawings. The molding for the bottom may be purchased or made by hand. It should be a heavier molding than the handmade one used around the job.

After the woodwork has been finished, sandpaper it very thoroughly and see that the surplus glue is removed. Stain, sand the surface lightly, and apply three coats of white shellac, rubbing between each coat with very fine steel wool (or use a varnish finish, if preferred). The inside of the drawers may be finished with a light stain.—W. L. DORRANCE.







### TENNIS-NET TIGHTENER MADE AT LOW COST

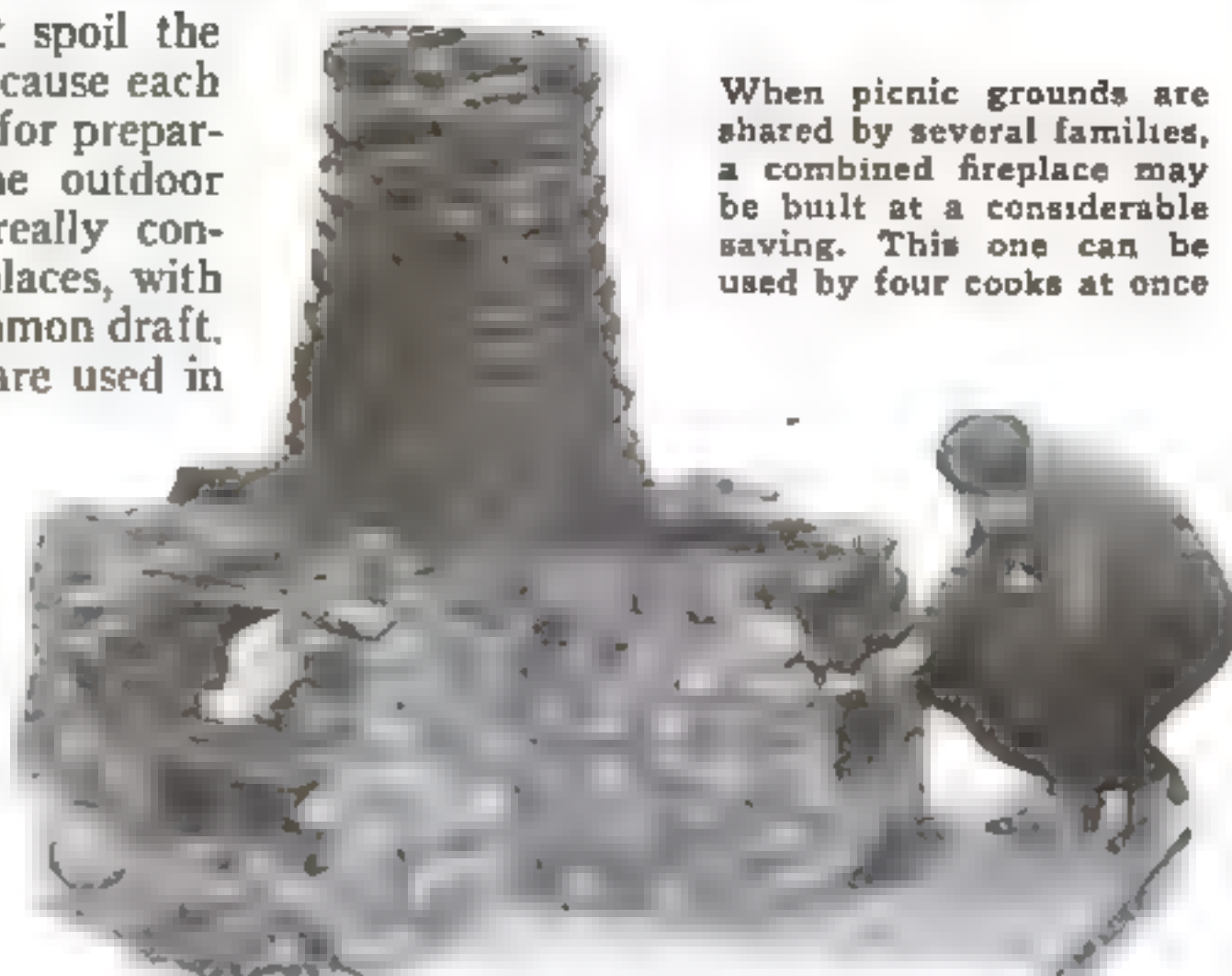
A SUBSTITUTE for an expensive reel for tightening a tennis net may be made from a piece of scrap iron such as half of a large strap hinge. It is bent and applied as shown above. The rope or cable that runs across the top of the net is passed over a pulley and fastened by means of a turnbuckle to the projecting arm of the tightener. The net can then be tightened merely by pressing the iron down with one's foot. To release the net at night, it is necessary only to kick the iron to one side.—JOHN J. CAMERON.

### FOUR PICNIC FIREPLACES IN ONE UNIT

TOO many cooks do not spoil the broth in this instance because each may have an individual fire for preparing a picnic luncheon. The outdoor stone fireplace illustrated really consists of four individual fireplaces, with one chimney providing a common draft.

Small rocks and cement are used in the construction. Each fireplace occupies a space 2 ft. square and 2 ft. high; the chimney, in center, is 2 ft. square and 6 ft. high. Bricks may be used instead.

*A large variety of designs for single outdoor fireplaces were given in a previous issue (P.S.M., June '36, p. 57).*



When picnic grounds are shared by several families, a combined fireplace may be built at a considerable saving. This one can be used by four cooks at once.



### SMALL SPRINGS HANDLED WITH CROCHET HOOK

SMALL steel crochet hooks, which serve many a model maker as drills, rigging tools, and the like, can be put to other uses. One of the hooks, if heated and bent to a convenient shape as shown at the left, makes a convenient tool for disconnecting and replacing small coil springs. The hook at the extreme end catches and holds the end of the spring securely as it is slipped over a hook or into a slot.—F.B.

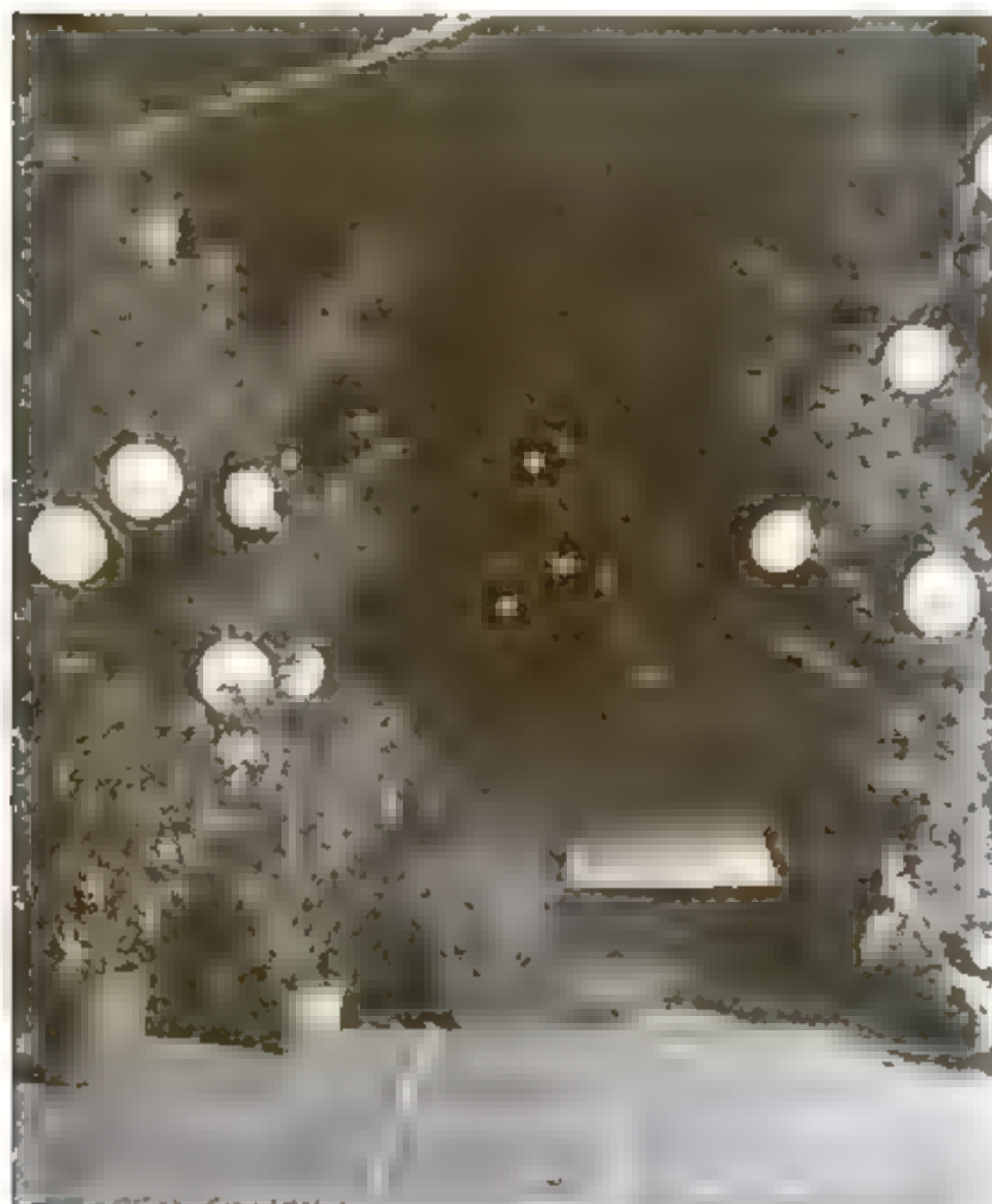
### ILLUMINATED BALLOONS FOR A GARDEN

SMALL electric bulbs, if inserted in inflated rubber balloons, form unique and colorful decorations to use for an evening garden party. The most convenient type of lamp for this purpose is one originally designed for use as radio pilot lights, but more recently put up in sets of tiny

candles for Christmas-tree decorations, as shown in one of the photographs below. The lamps are rated at 14 volts and are used in a series of eight on ordinary 110-volt house current.

Each Christmas-tree candle is placed in a test tube, which is then corked and inserted as shown into an inflated balloon. This may be done more easily if a little talcum powder is applied just inside the neck of the balloon.

The neck is so small that it must be stretched considerably to enable the test tube to enter, but this is an advantage because the tension insures an air-tight fit. There will be no leakage, and neither string nor a rubber band is necessary to seal the balloon.—A. J. VIKEN.



A garden decorated with gayly colored balloons, each containing an electric Christmas candle of type shown at right



Distinctive neckerchief ring made by sawing the ends off a large black walnut and working the interior shell to shape with a small gouge and a rat-tail file

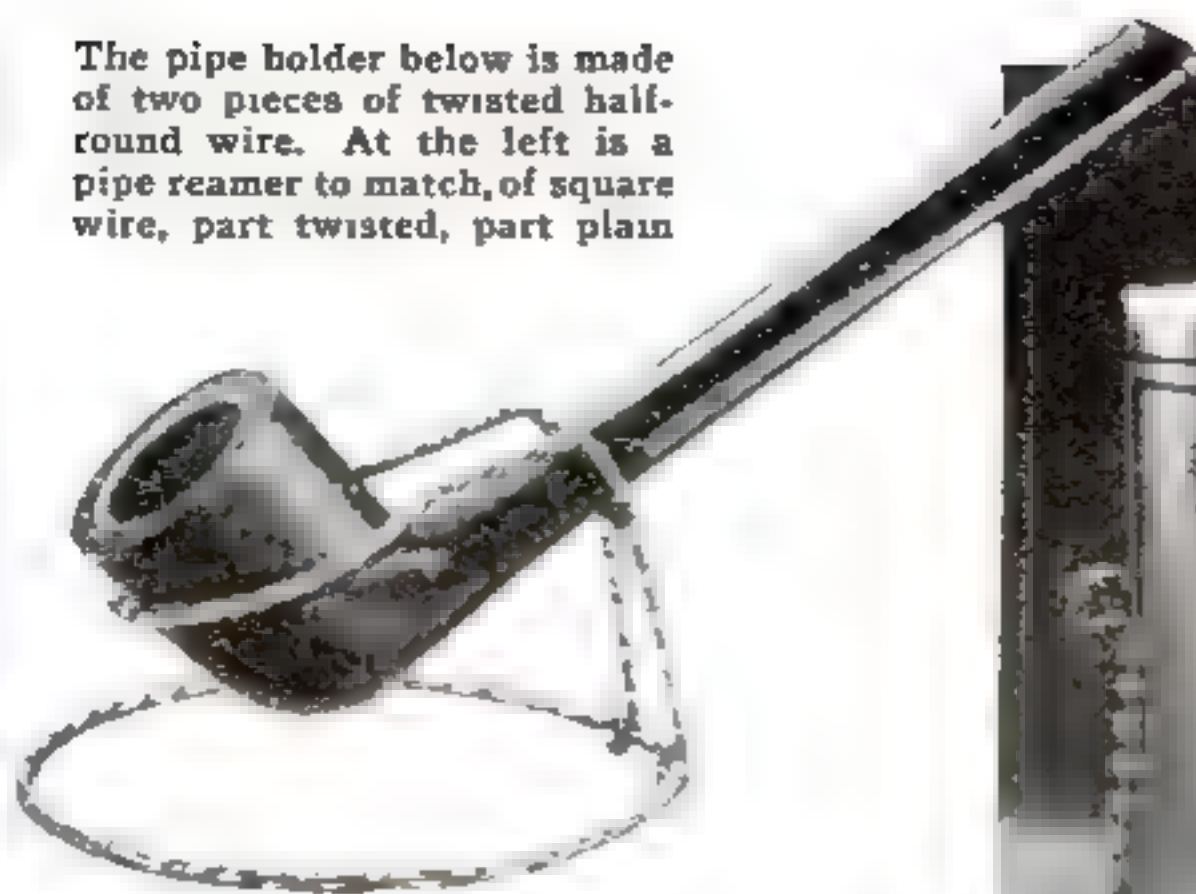
### NECKERCHIEF RING CUT FROM A BLACK WALNUT

A Boy Scout's neckerchief ring may be made from a large black walnut. Saw off the ends to leave the middle section about  $\frac{3}{4}$  in. thick. Then pick the meat out of this section and work the interior shell to shape with a small gouge and a rat-tail file. Smooth the cut exterior surfaces with a file and sandpaper, and finish the ring with varnish or shellac, or leave it unfinished.—F. W. KUHLMANN, JR.





The pipe holder below is made of two pieces of twisted half-round wire. At the left is a pipe reamer to match, of square wire, part twisted, part plain



# Twisted Wire

## Forms Unique

# Smokers' Accessories

By KENNETH MURRAY

**A**FTER shaping brass wire by passing it through a drawplate and twisting it for ornamental effects, as described last month (P.S.M., Apr. '37), you can form it into innumerable attractive and practical articles, such as the smokers' accessories illustrated.

In assembling, ordinary soft solder is used, and the joints coated with a film of brass to hide the solder.

The nest of ash trays is fitted with four five-cent chromium-plated trays of about 4-in. diameter.

Loosely twist a piece of fairly heavy square wire and form it into a ring having the same diameter as the trays. At opposite points, file a shallow notch into which the ends of the wire used for the frame, or handle, can be soldered. A file is laid across the side of the ring to prevent the heat from traveling to the other soldered joints and loosening them. The handle consists of two long pieces of square wire, twisted separately and then twisted together.

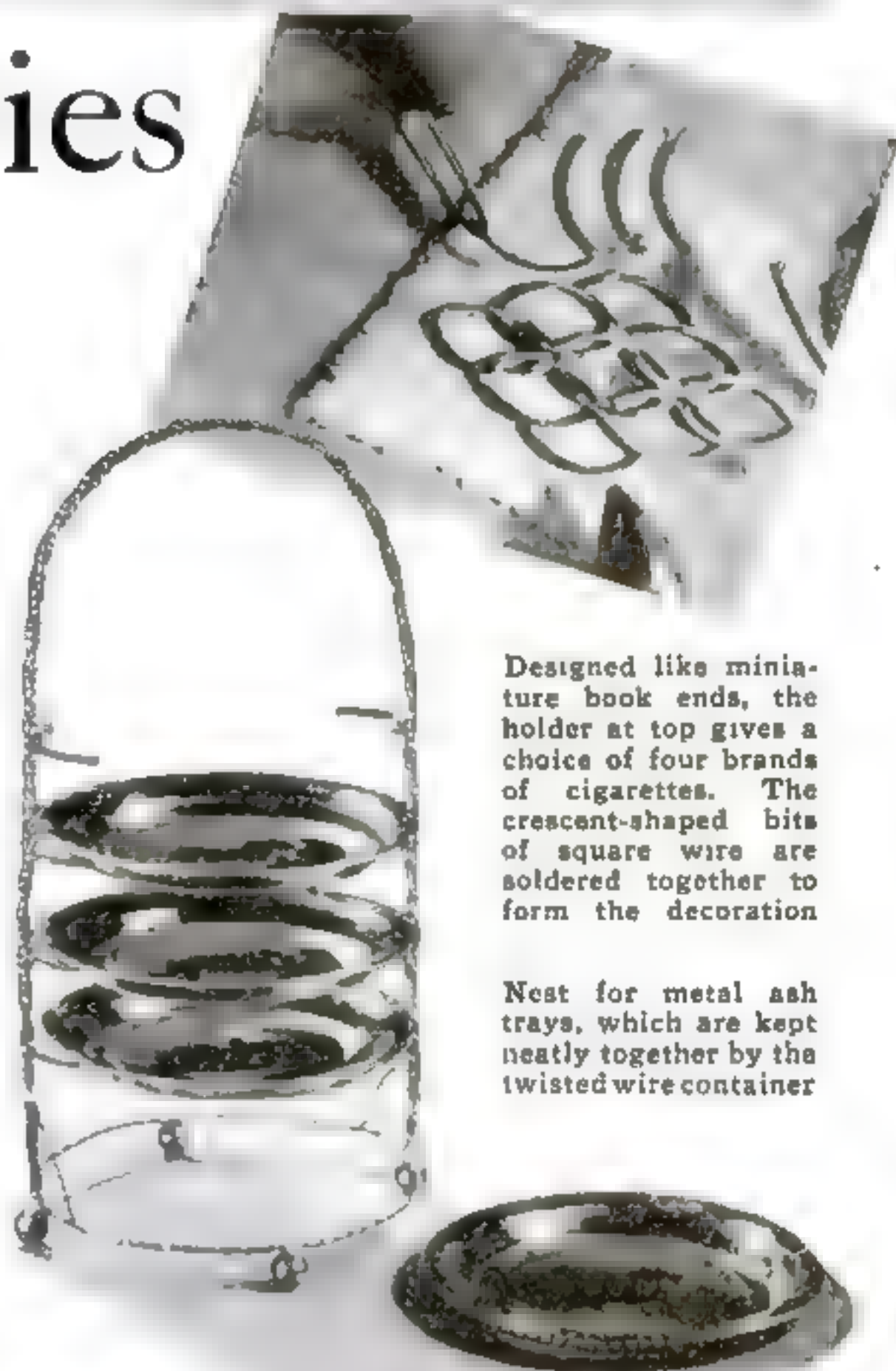
The  $\frac{3}{8}$ -in. ball-bearing feet are best

soldered to small rings formed of square wire. The tray supports are also of square wire formed into crescents, with the ends of each bent into loops.

All wire should be well buffed on a muslin wheel (or by hand with a pad and polishing paste) *before* assembling. However, if you have a small hand power tool, it can be used, with a felt wheel, to touch up parts of the completed project.

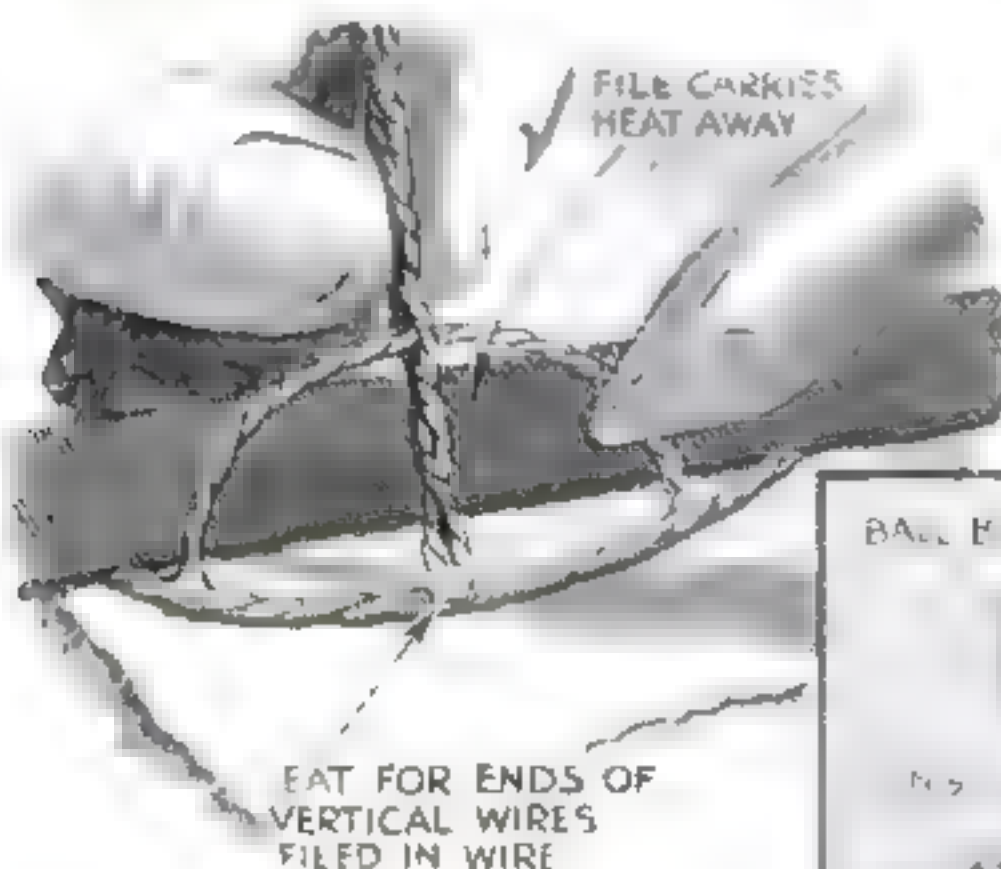
The individual ash trays can be further embellished with a length of small twisted square wire soldered around the edge of each. The Scotie outlined in fine round wire on each is advanced work. The wire was first shaped with long-nosed pliers, following a pattern on paper; it was then well tinned with solder, clamped to the tray, and the tray was heated to the melting point of the solder.

If you wish to serve cigarettes in a novel manner, keep several brands together with "cigends," as shown. Make the clip from heavy twisted square wire, with an ornamental wire panel at one end. This particular de-  
(Continued on page 114)



Designed like miniature book ends, the holder at top gives a choice of four brands of cigarettes. The crescent-shaped bits of square wire are soldered together to form the decoration

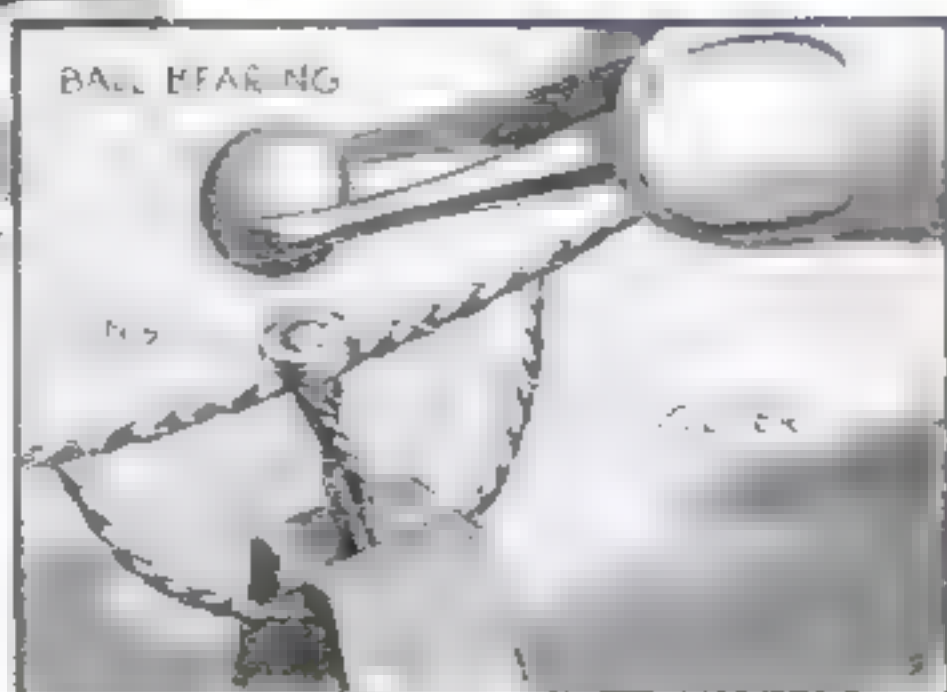
Nest for metal ash trays, which are kept neatly together by the twisted wire container



FILE CARRIES HEAT AWAY

FILE FOR ENDS OF VERTICAL WIRES FILED IN WIRE

When soldering joints like that above, file a depression in one part to take the end of the other. Right: A wire ring makes a strong seat into which to solder a ball



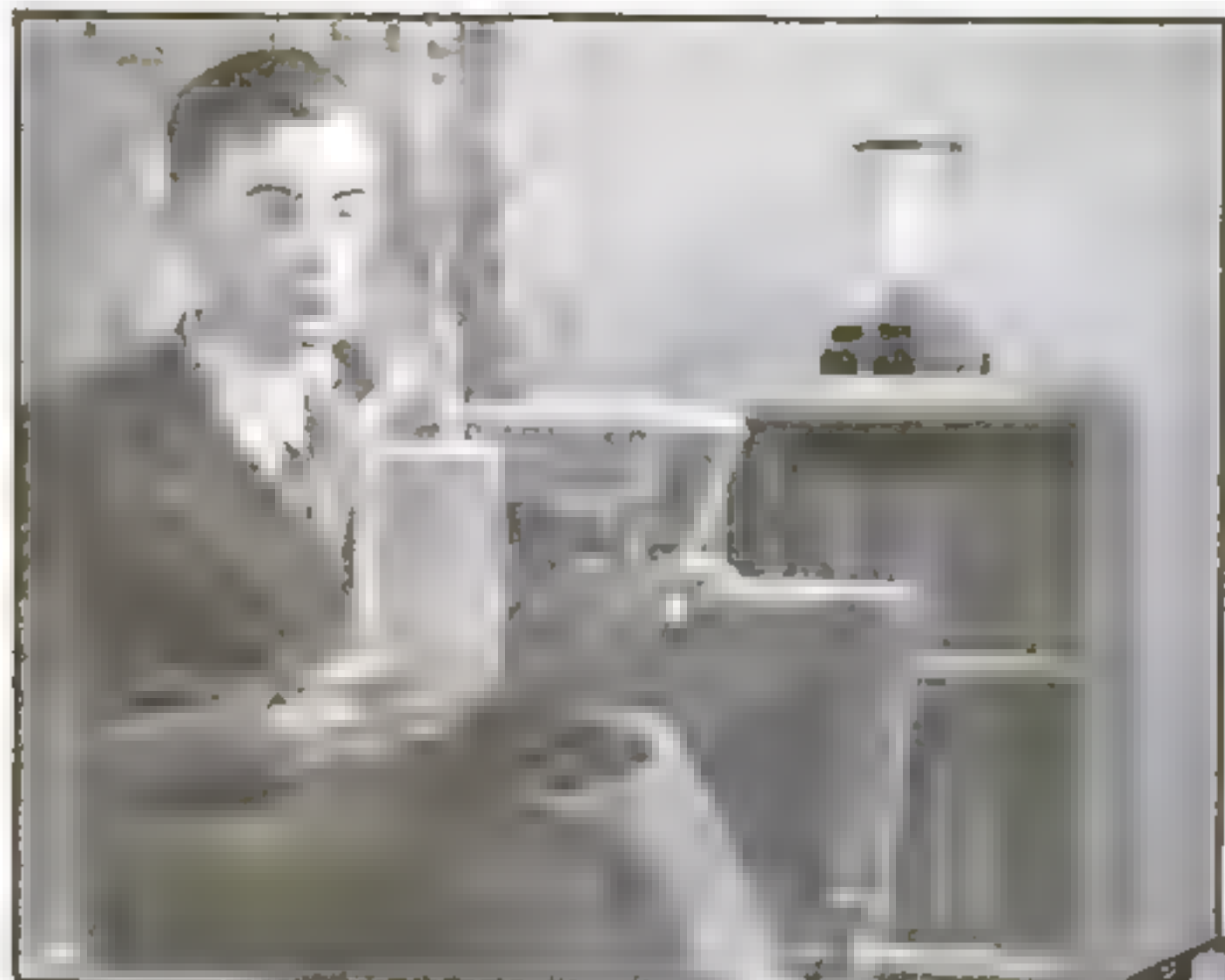
BALL BEARING



In constructing the ash-tray holder, the simplest way to attach the tray brackets is to hold the handle upside down between two suitable supports, in this case cardboard boxes



# Amber Glass Vanes Serve as Shade for Lamp



The completed lamp and, below, how the strips of glass are tapped very gently into the slots cut for them in the base



**G**LASS vanes set like the sails of a horizontal windmill form the shade of this unique lamp. Polished black wood and textured amber glass lend beauty to the dignified modern design.

The  $2\frac{1}{8}$  by  $6\frac{11}{16}$  in. glass strips, cut to size, should cost about ten cents each. Grinding the edges and one end of each will probably cost twenty cents more, but they can be quickly ground at home. In preparation for grinding, look the strips over and lay them down on the bench in order, with the straightest edges to the left and the rough side up. Then clamp one lightly in a vise, straight side up, using a protective pad of felt or several thickness of cloth to prevent breakage. Break off the corners of the upper end with pliers, remembering that the radius of curvature, after grinding, is about  $\frac{1}{4}$  in. Set a can of water near at hand, dip into it an ordinary flat, coarse-grained oilstone, and rub it firmly over the glass edge, using a sweeping, elliptical motion. It is surprising how quickly the lumps are smoothed off and the edges brought to a uniform, dull surface. Give a few strokes along the corners to chamfer them a little. When the edge is done, hone the other edge near the upper end, which is the only inner-edge part that can be seen after assembly; and finally do the end, rocking the stone around the corners to bring them to shape.

The base may be turned from a single piece of hardwood or pine; but it is better, to prevent warping, to build it of three thicknesses. Turn the lower section of the base on a faceplate, bore the 1-in. center hole, sand glass-smooth, and remove. Turn the upper part of the base in the same

If a router is not available, a twist drill will serve for roughing out the glass slots

way, but before boring it, mark two circles with pencil, one 3 in. in diameter, the other 5 in., and lay off four diameters at angles of 45 deg. with each other.

In laying out the glass mortises, note that the inner sides are tangent to the 3-in. inner circle and extend  $\frac{1}{8}$  in. beyond the diameter. The mortises can be routed out with a drill press, using an ordinary twist drill. To glue the base sections together, align the center holes.

Turn the upper ring from five-ply hardwood. Mark it for notching by laying it on the base and marking the edges with a pencil. Turn over, connect the points, saw the notch sides, and chisel to a depth of  $\frac{1}{4}$  in. To make sure that it will be engaged with the glasses for which it is notched, make an awl punch between two of the notches on the underside, and mark the base to correspond.

Black brushing lacquer is an excellent finish. Rub down the next to the last coat with split waterproof No. 6/0 sandpaper and water. Apply another coat, let it dry overnight, and rub it down with pumice stone and water.

Before assembling the lamp, screw to the base a porcelain cleat socket to which the ends of the lamp cord have been connected by bringing them through the screw plate holes from underneath. Give it a coat of black lacquer.

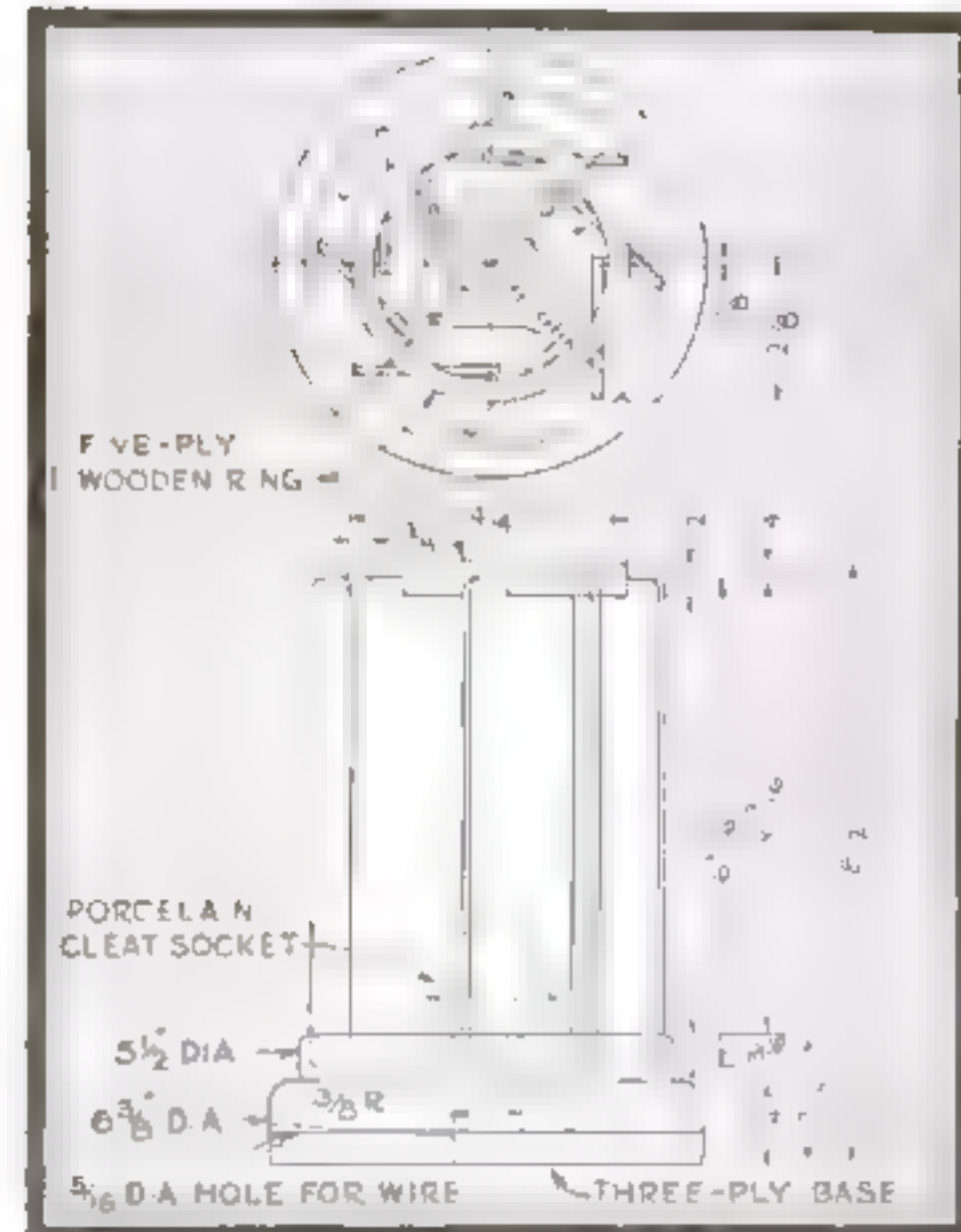
Now press the glass strips into the mortises. Tap the ends with a light hammer cushioned by a wooden block.

Coat the upper ring slots with lacquer before putting

it in place, and after drying, scrape off any squeezed-out paint. Take care to align the edges of the strips so that all will be parallel and vertical.

A light globe of the lantern-chimney type is best for this lamp.

If a polished-metal finish is desired, the base and top ring can be coated with metal at any plating works, but better results are obtained if aluminum or brass castings are made with the wood parts serving as patterns.



Side and top assembly views. The base is made first, and the top ring marked from it

## WICKS KEEP PLANTS WATERED

To INSURE your potted plants' getting enough water while you are away from home for any extended period, try the little stunt illustrated at the right. Place a pail of water on a box behind and a little above the plants. Cut strips of cotton

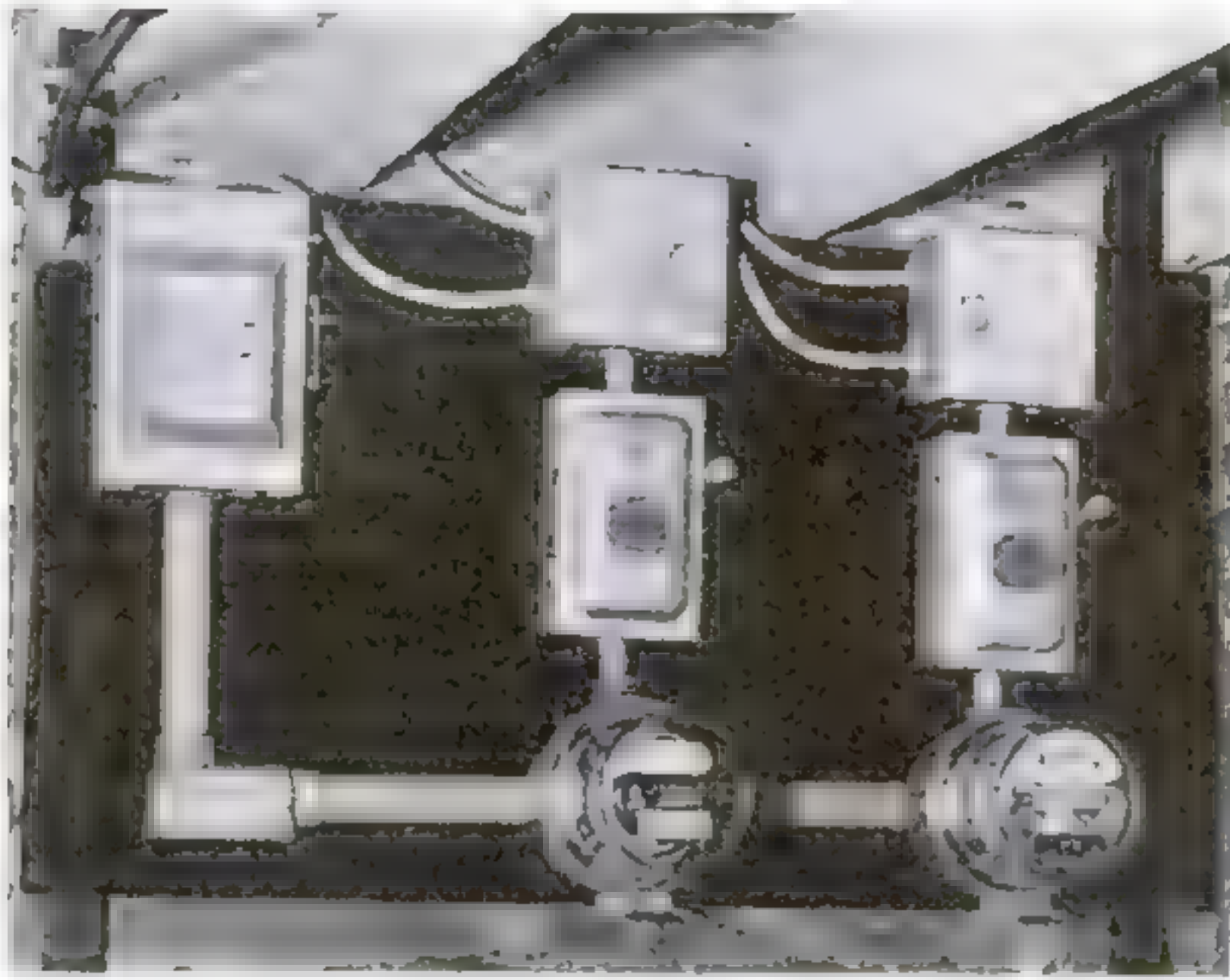
flannel 3 in. wide and long enough to reach from the bottom of the inside of the pail to the plants. Fasten a small weight to each end of each strip to hold it firmly in place. These wicks will carry enough moisture to the plants to keep them alive as long as the large supply of water in the central reservoir holds out.—GEORGE L. GILBERT.



Going to build a ship model? You can save time by using one of our kits (see page 20).



# Watch Your Cellar Wiring



*It must be properly installed and maintained to avoid fire hazards . . . Approved methods of adding new lights and outlets*

By HAROLD P. STRAND

**SAFE WORK**  
A modern two-family meter board with new type socket meters, switches, and fuse cabinets. The circuits run in BX

**I**T IS a good plan to make an occasional check on the safety of the wiring in your cellar. With open floor timbers, the wiring is usually exposed to view, and it may become damaged in a number of ways. I have seen BX cable stretched across the bottoms of timbers and lumber stored up in the bays with nothing holding up the weight but the armored cable. It is not likely you would permit a hazard like this in your home, but many other faults may exist. Should you desire an extension of the wiring to an additional light or perhaps to a base outlet for the room above, never attempt to do a "cord" job of it. If the wiring was done originally in armored cable, use the same material; and this is also true of rigid conduit or any other approved method of wiring. Next, use the correct fittings that the Underwriters approve for the purpose. If you are in doubt about any of the details, consult your local wire inspector before you start the work, get an official permit issued, which will start the job off right, and have the work inspected when you finish.

Before adding a single new outlet to an existing circuit, the present load on that circuit should be checked. This is done by loosening the fuses in that circuit and counting up the number of outlets that do not light. On an ordinary branch circuit, except under a few special conditions, the National Electrical Code makes a limit of twelve outlets. If the proposed additions would cause this limit to be exceeded, it then becomes necessary to run a special circuit from a new cut-out block in the fuse cabinet to the new work.

Let us take as an exam-

ple a case in which new lights, perhaps of the modern luminous tube type, have been installed in the bathroom, and BX cable has been dropped from the outlet boxes in the wall to the cellar. What is necessary to complete the wiring?

The ends of the cable are connected to a 3-in. junction box as shown below. From this box a line is run to the fuse cabinet on the meter board. According to the Code, the line could be continued on in armored cable if the cellar is dry. In some cities, however, local regulations call for rigid conduit in all cellars, as was the case here. For this purpose a new material will be found excellent and easy to install. It is known as thin-wall tubing. It requires no threads, and one view shows how a box connector is tightened with only a wrench. This line was made a new circuit because the cellar circuit, when

checked as previously described, was found to contain eleven outlets already. We could not add two new outlets and keep within the limit prescribed.

If a bend or offset is required in the tubing, special benders are used by electricians, and an illustration shows how one is operated. A grooved quadrant fits over the tube as it is bent and prevents it from spreading at the bend. If such a tool is not available and cannot be borrowed, the home worker will have to improvise a jig to serve the same purpose.

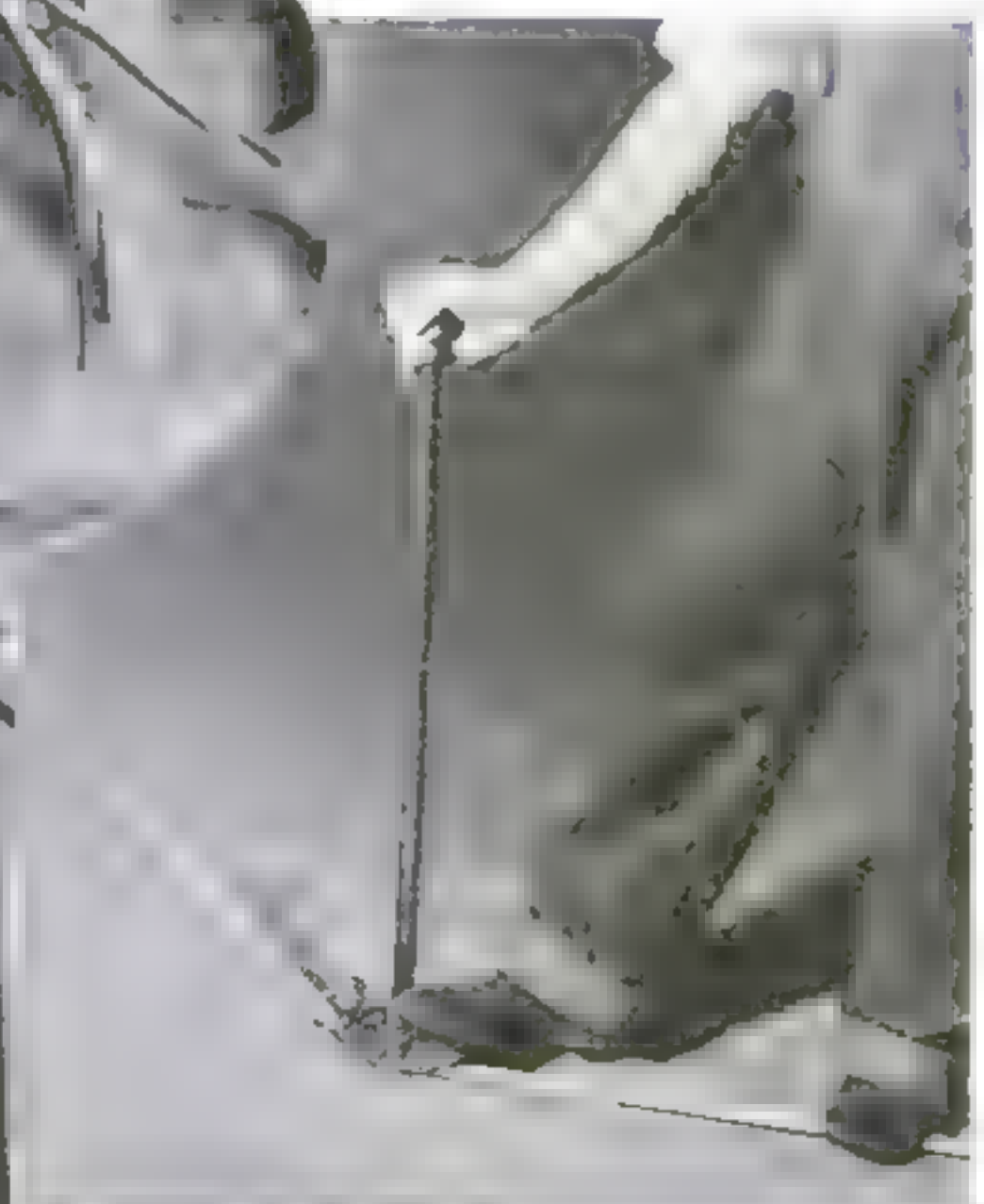
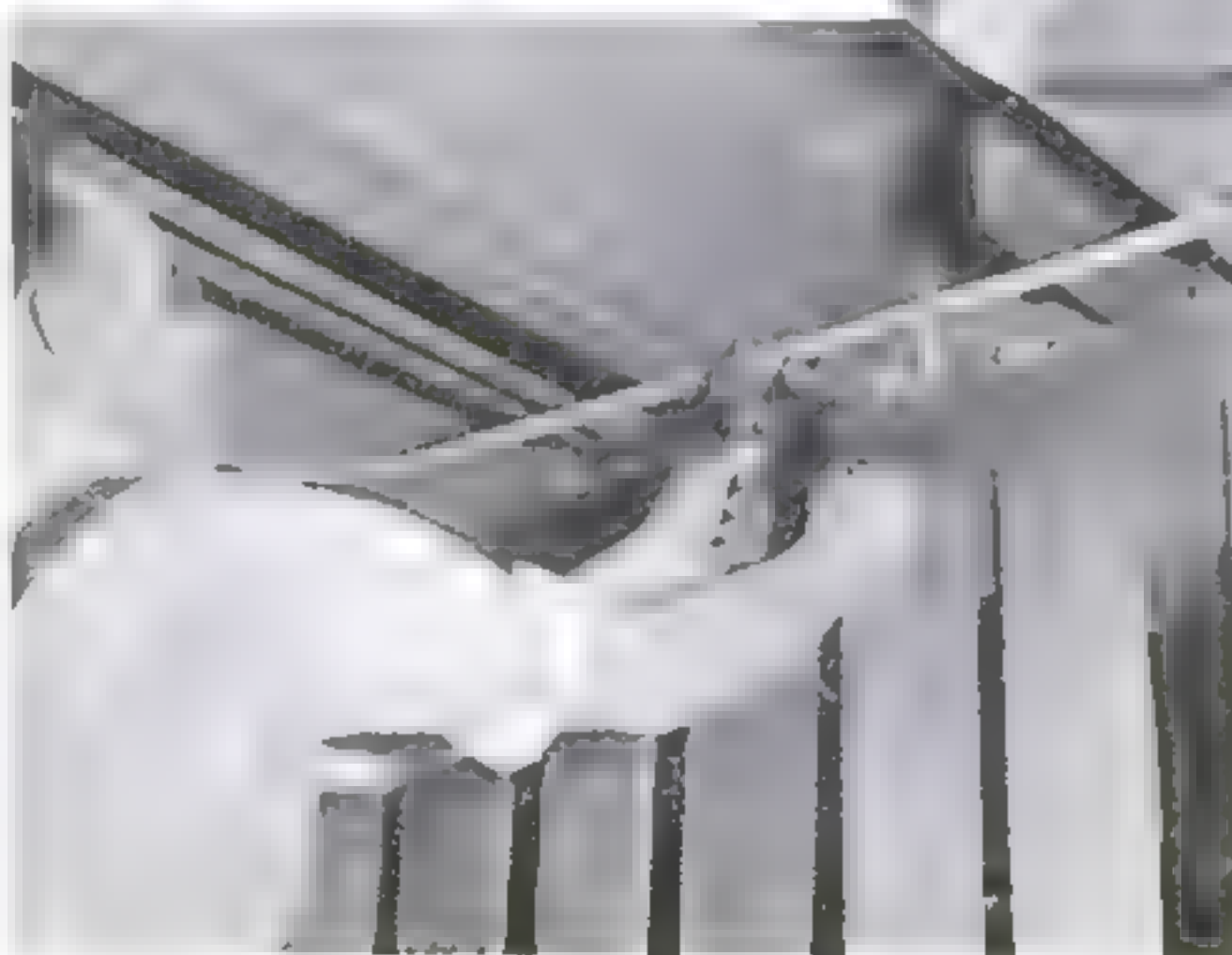
Tubing is very easy to cut with a sharp, fine-tooth hack saw. Be sure after each cut to remove the sharp burr from the inside edge with a reamer, so the wires will not be damaged when they are later pulled in.

This thin-wall material comes in 10-ft. lengths and in sizes similar to pipe up to 2 in. in diameter. Special couplings are provided with two clamping nuts that compress split rings tightly on the tubing and effect a tight joint. Two wrenches are used to tighten a coupling. Pipe straps of a size to fit the tube are used at reasonable intervals to secure it to the timbers.

If some new cellar lights are needed, it is a good time to include them in this new run or circuit, or perhaps some

*(Continued on page 111)*

*In circle: No threads are needed for the tubing, and a box connector is tightened with only a wrench. Below: Two wrenches are used for a coupling*



The tubing is easily bent, either with this special tool or by any method that will prevent it from collapsing in the process



# *Prize-Winning* Ideas to Help You

*An economical way to make an all-steel frame . . . A hitch from junk materials*



In our trailer contest, a method of welding the framework won a prize of \$100 for George M. Clark

**C**ONSTRUCTION details for building an all-welded steel trailer frame with stock materials, which can be used with a light towing car, won first prize in our recent trailer contest (see P.S.M., Jan. '37, p. 91). George M. Clark, the designer, estimates that the complete trailer—streamlined in the modern mode and weighing about 1,000 pounds—costs less than \$150 to make.

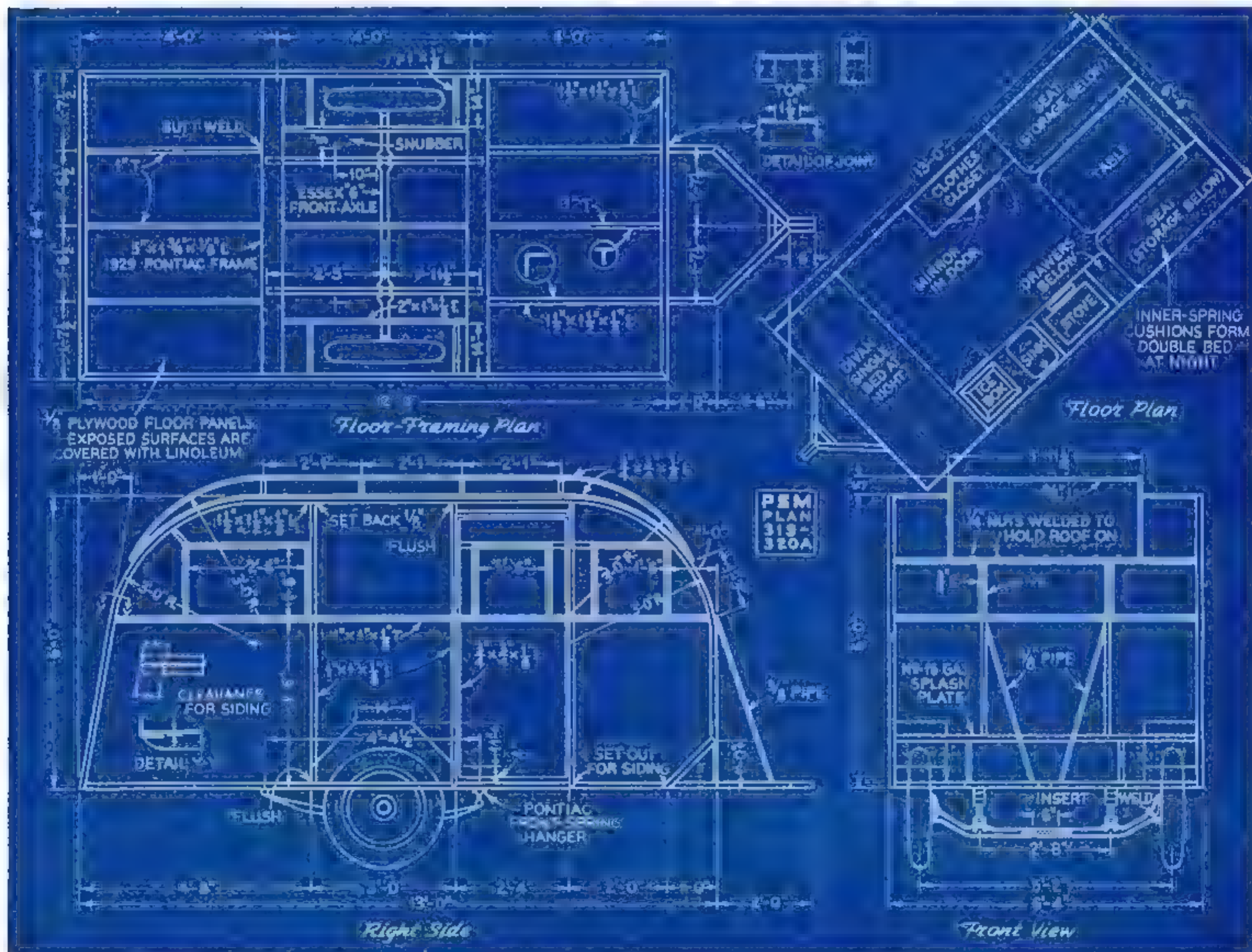
Hundreds of entries were submitted and they contained so many excellent ideas that the judges awarded two extra prizes (a total of seventeen prizes) and gave honorable mention to five other contestants. The entries fell into three main divisions: chassis, body, and fittings. The first classification is reviewed

here; the other two will be discussed later.

Only a limited number of tools are needed to cut and fit together all the pieces of Mr. Clark's trailer. The hiring of a mechanic to do the welding is included in his estimate, which will be less if the builder can do it himself. The list of materials and approximate weight and cost will be found on page 110.

Obtain the following from your local wrecking yard: axle, wheels, springs and hangers, snubbers; two frame side rails 3 in. deep with a straight section of 6 ft. 4 in.; door lock; two dome, two parking, and two tail lights; seven wind-shield hinges of the "piano type," and an aluminum threshold. Lengthen the axle 6 in. and weld the spindle bodies to the axle to eliminate any possibility of loose connections. Snubbers are desirable and may be obtained from the rear of any light car. Model-T Ford brake bands make good replacement straps.

Assemble floor framing and running gear complete as shown. Bend angles for side and roof framing to a 3-ft. radius.





# Build a Better Trailer

. . . *Low-cost axle . . . Installing vacuum brakes . . . Monowheel for light duty*

This can be done in an angle roll, in a blacksmith's plate roll, or the metal may be forged and hammered to shape over the open side of a short 8-in. channel. Next bolt the 3/16-in. pressed composition wood or other suitable roof and siding material every 6 in. as indicated. The siding goes back of the 1½-in. curved angles and outside the floor frame to give a weatherproof joint. Lay the roof on top of the angles and carry it down to the T-irons below the front and rear windows, using pitch to seal the joints.

In framing the windows, place the T's with the legs out, which provides a practical weatherproof joint with the siding. A hood can easily be placed over each window. Use desk slides for operating the windows from the inside, and install sponge-rubber weather strips as shown. Screens with sheet metal frames can be mounted inside.

Treat the  $\frac{3}{8}$ -in. plywood flooring with hot linseed oil and then paint before bolting in place. Insulation is shown under 6 ft. of the roof but the builder can work

out a way of covering the walls also if he prefers. Interior details are left to the discretion of the builder, only a suggested floor plan being given.

Make the fenders of No. 22 gauge galvanized iron, all seams lapped, or riveted and soldered.

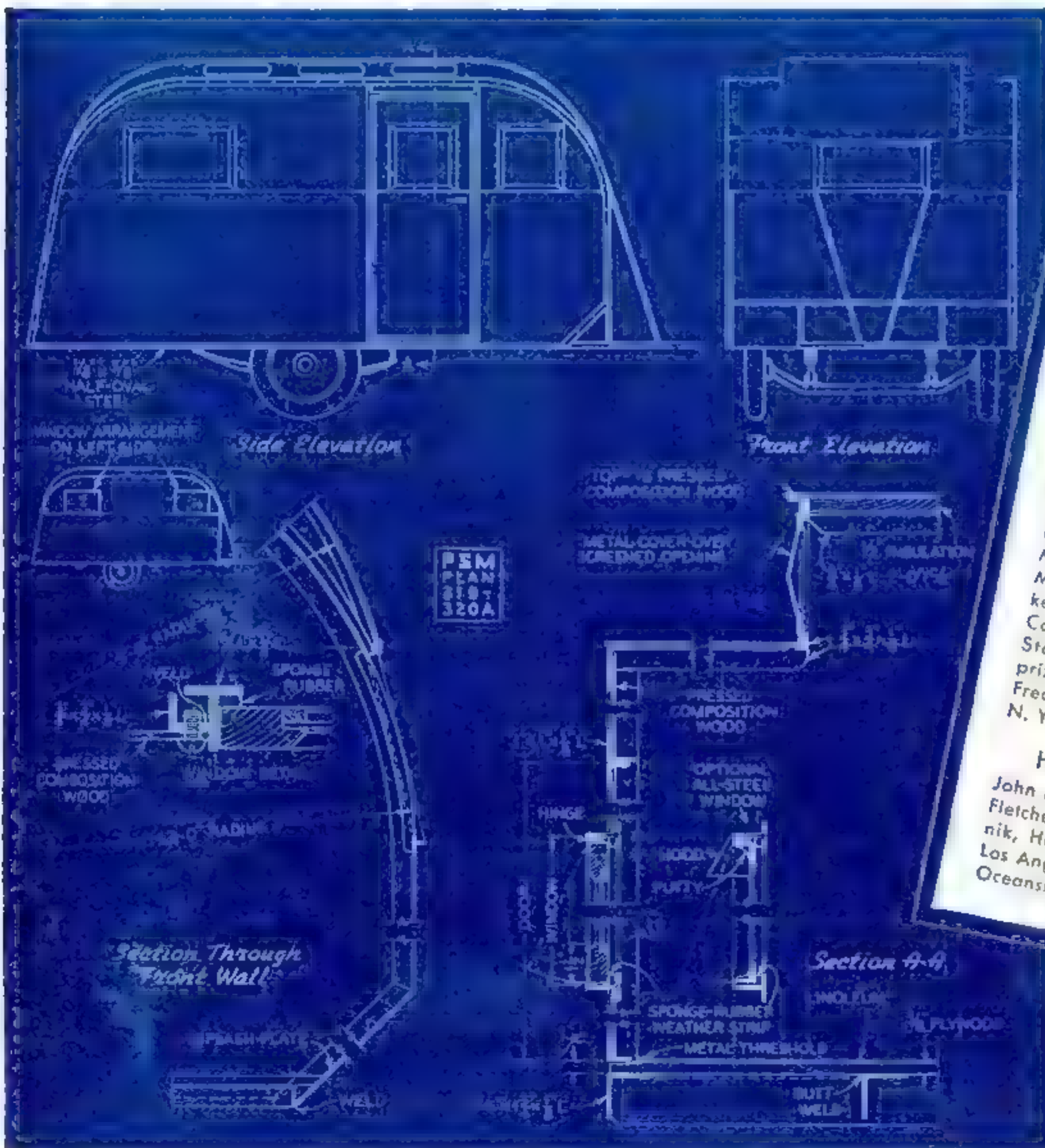
A trailer hitch which can be made from parts of an old model-T Ford won a prize for Robert Leininger. To build it, cut one complete member of the frame from the rest of the frame and remove all loose parts. Cut V-notches in the flanges as illustrated and bend to provide a flat face for a model-A radius-rod socket assembly, giving the necessary drop from the car hitch to the trailer frame.

Cut two more notches in the flanges on both sides at points representing the width



This homemade monowheel by Carroll E. Bradberry was awarded fifth prize. Drawings and description are given on the next page

of the trailer frame. Then bend it again to straighten out the two frame members, and bolt in place. Peen a recess into the front face to provide a space for the socket. Machine a ball from a piece of axle steel and thread for a  $\frac{1}{4}$ -in. nut. Place the ball in the rubber shock ab-



## WINNERS

In Trailer Construction Contest

FIRST PRIZE, \$100  
George M. Clark, M.D.

**FIRST PRIZE, \$100**  
George M. Clark, Newgulf, Texas

**SECOND PRIZE, \$50**  
Johannes S. ...

**SECOND PRIZE, \$50**  
Johannes Schneider, D.

**THIRD PRIZE, \$25**  
P. Hanford, Kent

**FOURTH PRIZE. \$15**

FIFTH PRIZE, \$10  
E Bradberry

**LIVE PRIZES, \$5 EACH**

P. Fletcher, Ann Arbor, Mich.; Rob-  
t Marshall, Olympia, Wash., D. C.  
rrey, Sturgis, Mich.

ay, Sturgis, Mich.; Harold P. Ryk  
Kalispell, Mont.; F. E. Snider,  
e Girardeau, Mo.; Donald  
bler, Eaton, Pa.

W. Vogel, South Ozone Park,  
John Wells, Portland, Ore.

### HONORABLE MENTION

nder, Rocky Ford, Colo.; W. J.  
Livermore, Calif.; Joseph Hus  
nell, N. Y., Hearn Peniston,  
les, Calif.; Miles R. Stireman,  
e, N. Y.

James R. Stireman,

The drawings at left and on the opposite page were submitted by Mr. Clark to illustrate in detail the application of fully welded construction in a typical trailer



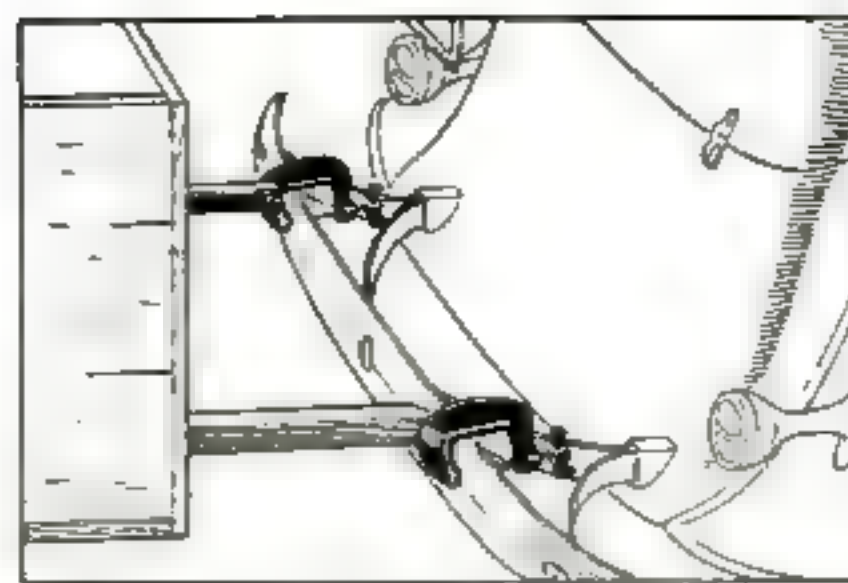
sorber; then put it into the socket and bolt on the front face. Weld all cuts in the frame and insert a brace as shown.

Donald G. Staebler won two prizes with his ideas for an economical homemade drop axle and power-brake hook-up. To make the axle, obtain Chevrolet wheels, hubs, spindles, and also brakes, if desired, from a wrecking yard. Any parts from 1928 to 1933 may be used. Saw off the kingbolt boss at the top of the spindle flange to give a flat surface against which is bolted a 5 by  $\frac{3}{4}$ -in. cold-rolled steel plate. If brakes are used, it may be necessary to shim up slightly between the plate and the flange with washers.

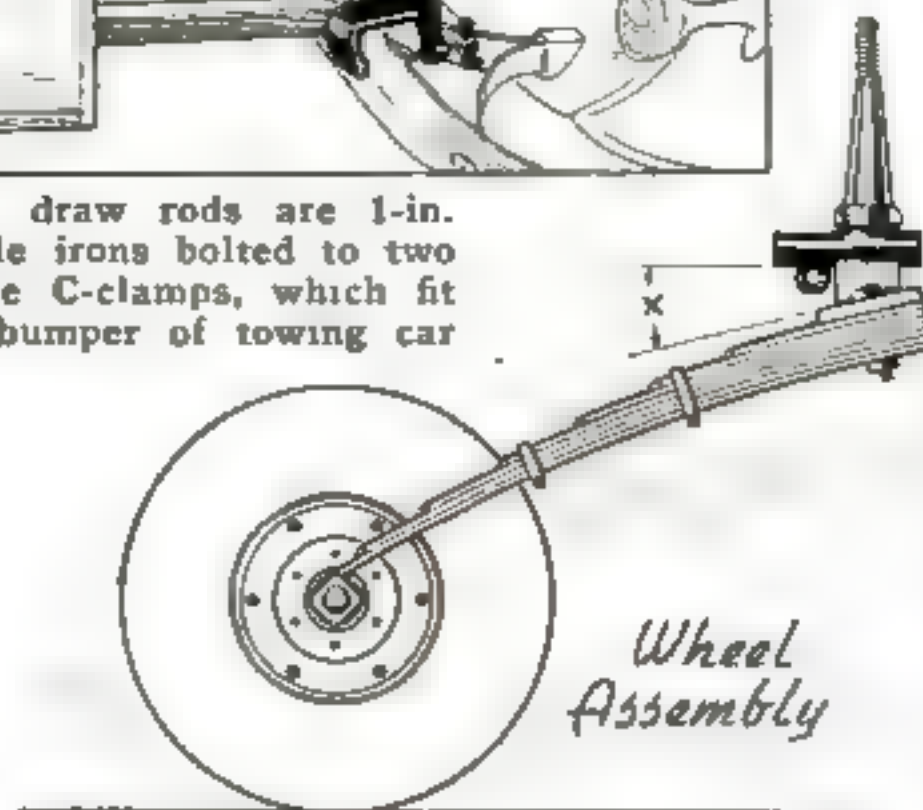
Get a piece of  $1\frac{1}{2}$ -in. steel tubing or solid steel to use as an axle. The length will depend upon the tread desired. Make a collar which can be shrunk on the shaft and bolted to the plate with six cap screws. Weld to axle shaft. A spring pad may be made from a piece of steel 3 by 4 by  $\frac{1}{2}$  in., riveted and welded to the shaft. If work is accurate, wheels will be aligned.

In order to make the power brakes, obtain a vacuum cylinder of the type used on the automatic clutch attachment of the 1933 Plymouth. Remove the valve and the pendulum controlling the relief valve. Make a cap out of 1 by  $\frac{1}{4}$ -in. strap steel to fit the flanges on both the valve and cylinder where they were separated. Drill and tap both for  $\frac{1}{4}$ -in. pipe, and screw in place with gaskets between; then screw in  $\frac{3}{8}$ -in. copper-tubing fittings. Solder a copper mesh screen over the relief-valve opening in rear of cylinder.

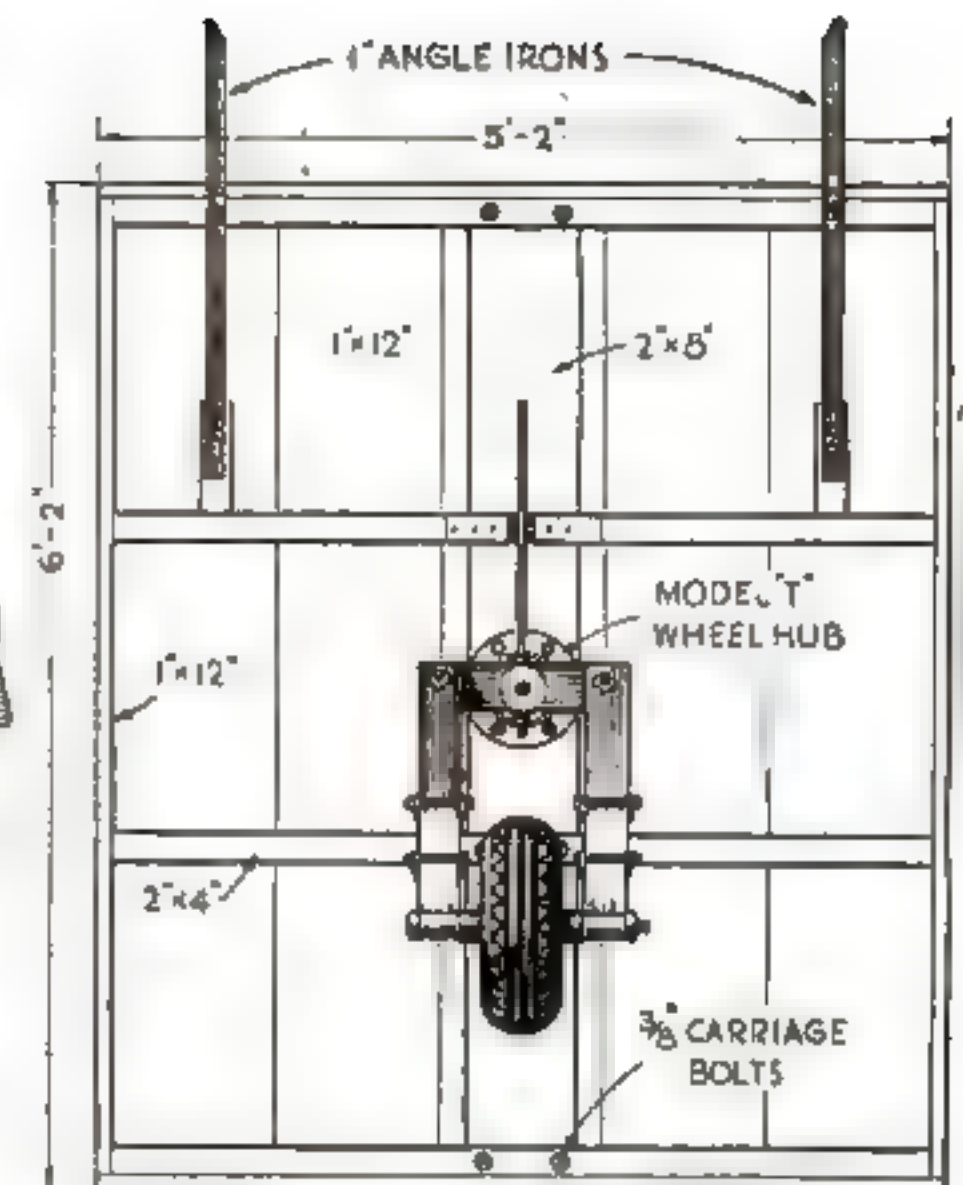
Fasten the cylinder to the frame of the trailer on a pivot bolt as shown. Arrange the levers to give the cylinder as much leverage as possible. Fasten valve to steering column below the floor boards and connect the valve plunger to a choke or similar control placed near the steering wheel. Connect a rubber hose to the valve and run it to the intake manifold. Appropriate fittings can be obtained to connect to the wind-shield wiper outlet. Connect the flange fitting to  $\frac{3}{8}$ -in. copper tubing,



The draw rods are 1-in. angle irons bolted to two large C-clamps, which fit on bumper of towing car



Wheel Assembly



Details of the monowheel made by Mr. Bradberry, and a bottom view of trailer box showing how wheel is mounted and kept from swiveling when not being towed

which runs to the rear, and connect with the trailer by means of rubber hose.

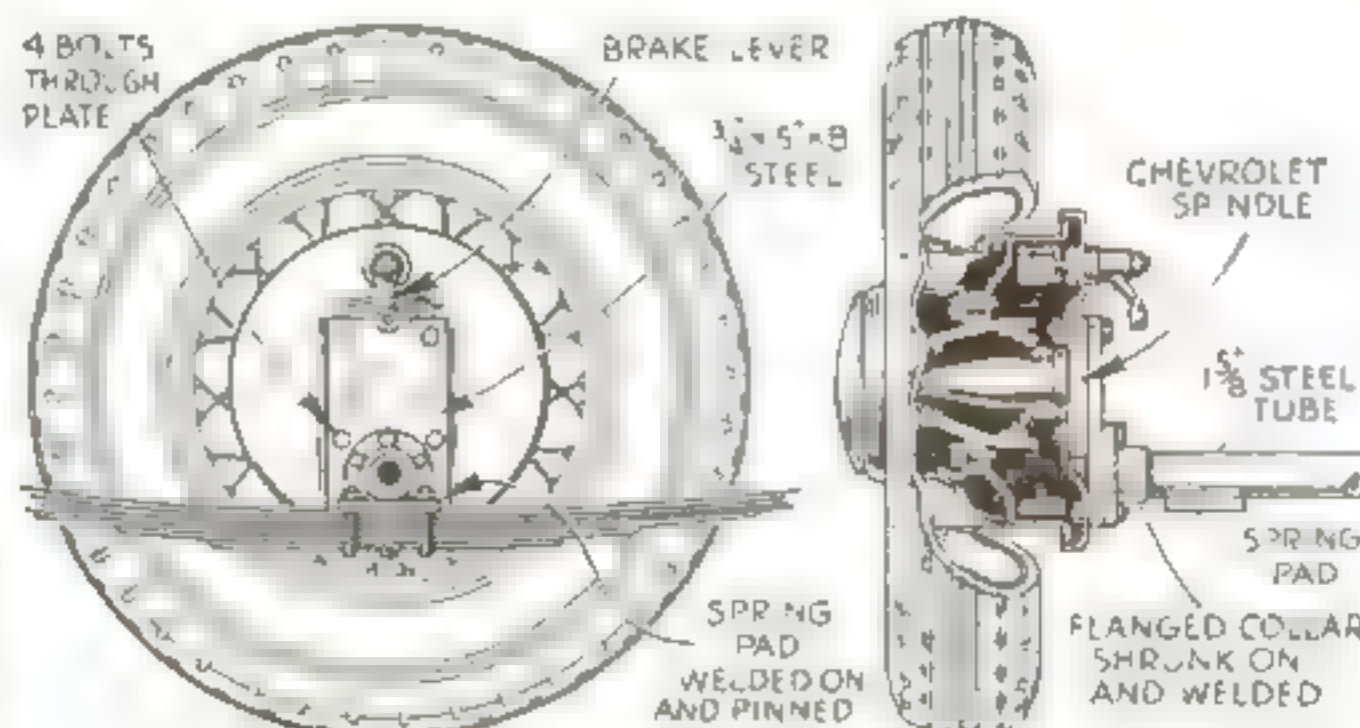
An inexpensive monowheel trailer, which is handy for short camping trips or carting luggage, won fifth prize for Carroll E. Bradberry. In constructing this type of trailer, first decide upon the wheel—a 14- or 16-in. wheel is about right. Do not select a tire that does not need a tube because it will not give good results when towed at speeds above 40 m.p.h.

Two old Overland cantilever springs, or any other similar springs, are used for the fork. Enlarge the eyes for the axle, which may be a large machine bolt  $\frac{3}{4}$  in. in diameter. Connect the heavy ends of the springs with a steel bar  $3\frac{1}{2}$  by 10 by

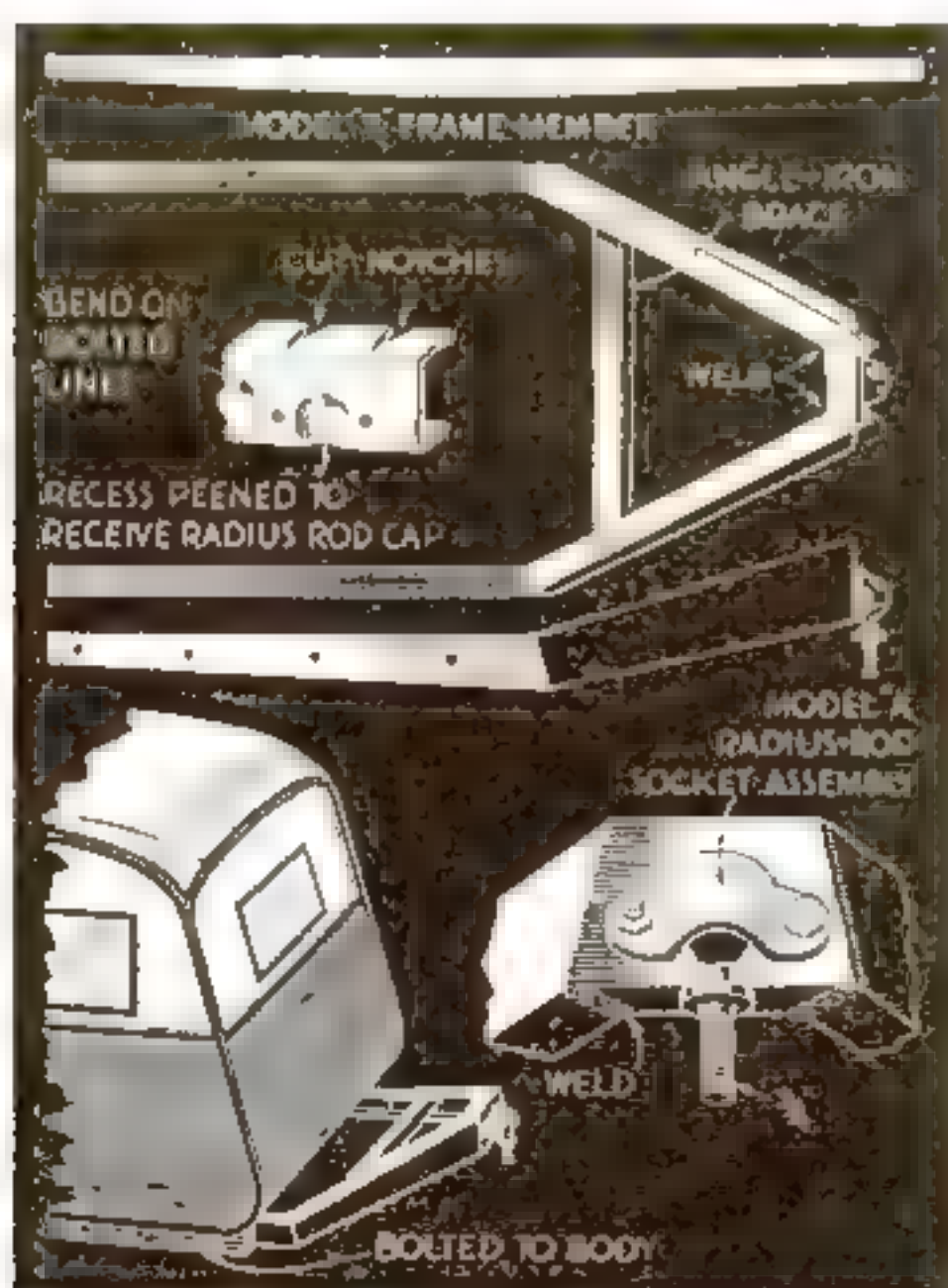
$\frac{1}{2}$  in. The length will vary slightly depending upon the size of the wheel. Weld a wedge-shaped steel block to the center of the bar as shown. The angle marked  $x$  is determined by the height of the bumper of the towing car. Arrange the trailer so it will be slightly lower in front when connected to the bumper to allow for take-up in the springs. Weld a model-T Ford front spindle in position on the block as shown, taking care to get it straight.

The box can be made as desired. In the sketch the model-T front wheel hub is shown bolted in center of box, but it is better to place it a trifle to the rear to help avoid bucking. The outside flange of wheel rests on the floor. Cover exposed end of spindle with large hub cap. To keep wheel from turning when trailer is disconnected, arrange for a  $\frac{1}{2}$ -in. round steel rod to be pushed into the hole in the spindle running lengthwise with the trailer. Secure one end of rod between two blocks fastened to one of the cross members. Remove rod before towing the trailer.

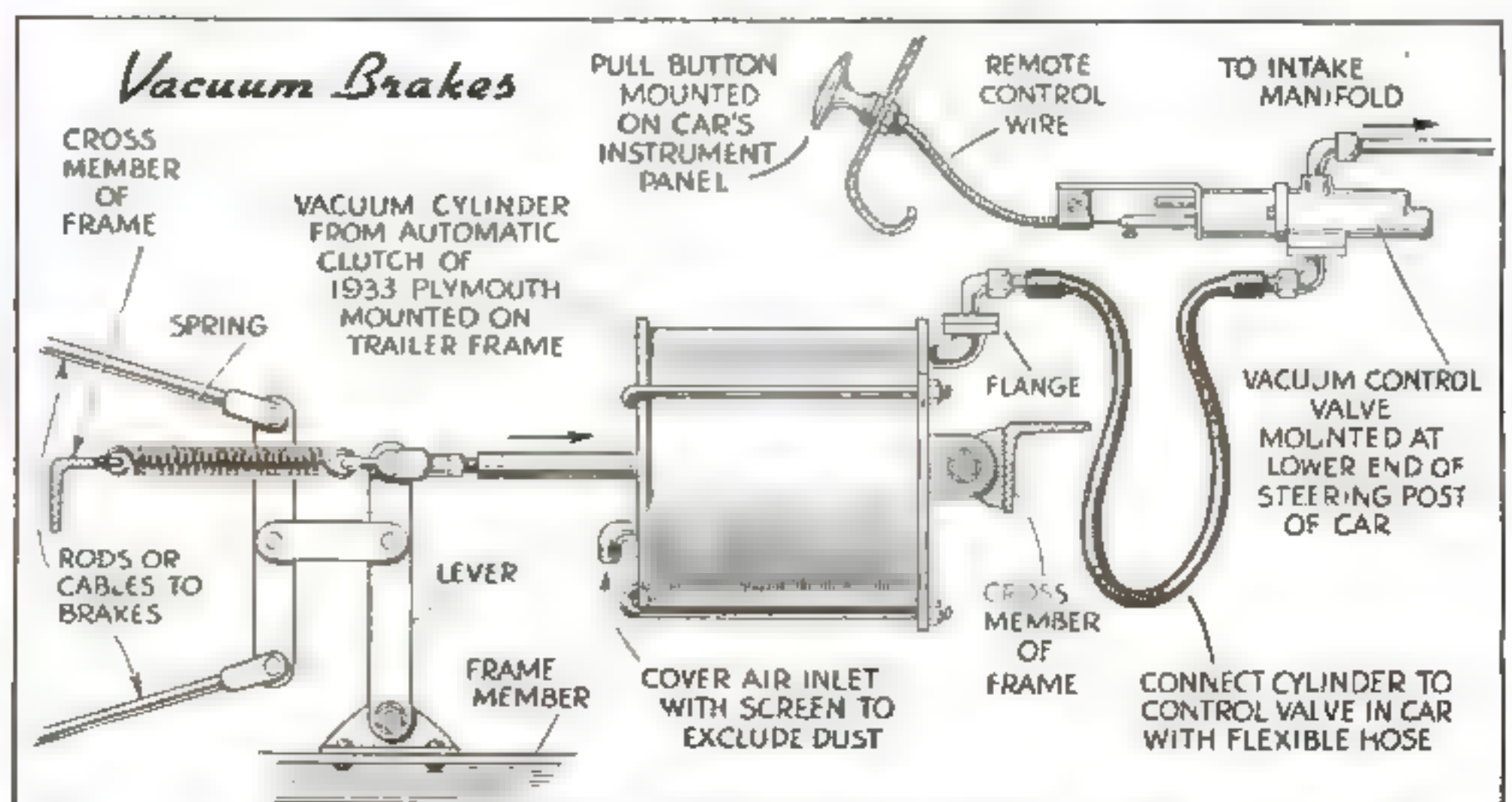
(To Be Continued)



Mr. Staebler's method of constructing an economical drop axle



Trailer hitch by Robert Leininger. At right is a diagram of the power brake submitted by Donald G. Staebler. The equalizer prevents locking one brake, and the pull-back spring helps release the brakes when vacuum is off





# GUILD Craftsman Wins Acclaim

WITH FINGERPRINT CAMERA



Narciso Reyes, of the Guild club in Manila, P. I., with his fingerprint camera. Left: President and secretary of the Brockton (Mass.) Homcraft Club

## Members of Spokane club build equipment for the blind, and other home workshop clubs report special activities

**E**VEN as far away as the Philippine Islands, the activities of National Homeworkshop Guild clubs are becoming news. Narciso Reyes, of Dujua's Homeworkshop and Hobby Club, *Manila, P. I.*, has been commended highly by police officials, the local press, and photographic clubs for a practical fingerprint and document camera he recently devised. It can be used for general reproduction work and because it weighs only six pounds is carried very easily. There are eight members in the club, and

each has his own workshop or laboratory.

The Inland Homeworkshop Club of *Spokane, Wash.*, recently made tables and other equipment for an industrial center established for the blind by the Central Lions Club. The Inland Club is one of the most active in the Northwest, and members let nothing interfere with their meeting nights.

Having participated in previous annual hobby shows in *Buffalo, N. Y.*, the Bison Homeworkshop Guild plans to sponsor this year's event and also to conduct a

more extensive toy project for next Christmas. Last year, 250 toys were designed, made, and wrapped by the members; then delivered without any outside help to eighty families.

Historical hand tools are being collected by the *Rockford (Ill.)* Homcraft Club to be placed in a large display case planned by L. T. Ryder, F. C. Burritt, and R. G. Alcock. The club has decided to purchase additional machinery and tools for its workshop with the \$100 won for the best civic project entered in the Guild's 1935 exhibition. A committee has been appointed to plan a pancake supper.

"Ladies Night" was recently held by the *Oklahoma* (Continued on page 98)

## WHY DON'T YOU, TOO, GET INTO THE GUILD?

**P**LANs for making various projects, book reviews, lists of cooperating manufacturers, detailed instructions for conducting meetings, and a wealth of other material are mailed free each month to secretaries of home workshop clubs affiliated with the National Homeworkshop Guild. Why put off any longer organizing a club so that you and your friends can enjoy these benefits?

The Guild is a noncommercial, nonprofit organization formed for the promotion of the home workshop hobby. It is anxious to have a club organized in every part of the United States and Canada, and will



Official Magazine  
POPULAR SCIENCE  
MONTHLY

be glad to help you start a club in your neighborhood. The minimum age for membership is sixteen years old. Clubs must have at least five members and must agree to hold not less than ten regular meetings a year and to abide by the Guild's simple

rules. There is no charge for any of its services or for the annual affiliate card provided for each member.

Fill out the attached coupon, or write a letter to the National Homeworkshop Guild stating that you would like to get a group under way, and full particulars will be sent at once. Be sure to inclose a large, self-addressed, stamped envelope.

**National Homeworkshop Guild**  
347 Fourth Avenue, New York

Please send me immediately full information on how I can organize a home workshop club in my community and receive the many free benefits of the Guild. Inclose your special bulletin telling where to meet, how to conduct meetings, how to obtain publicity, and how to draft a model constitution and by-laws. I am inclosing a large (legal size) envelope, self-addressed and bearing a three-cent stamp, for your use in sending this literature.

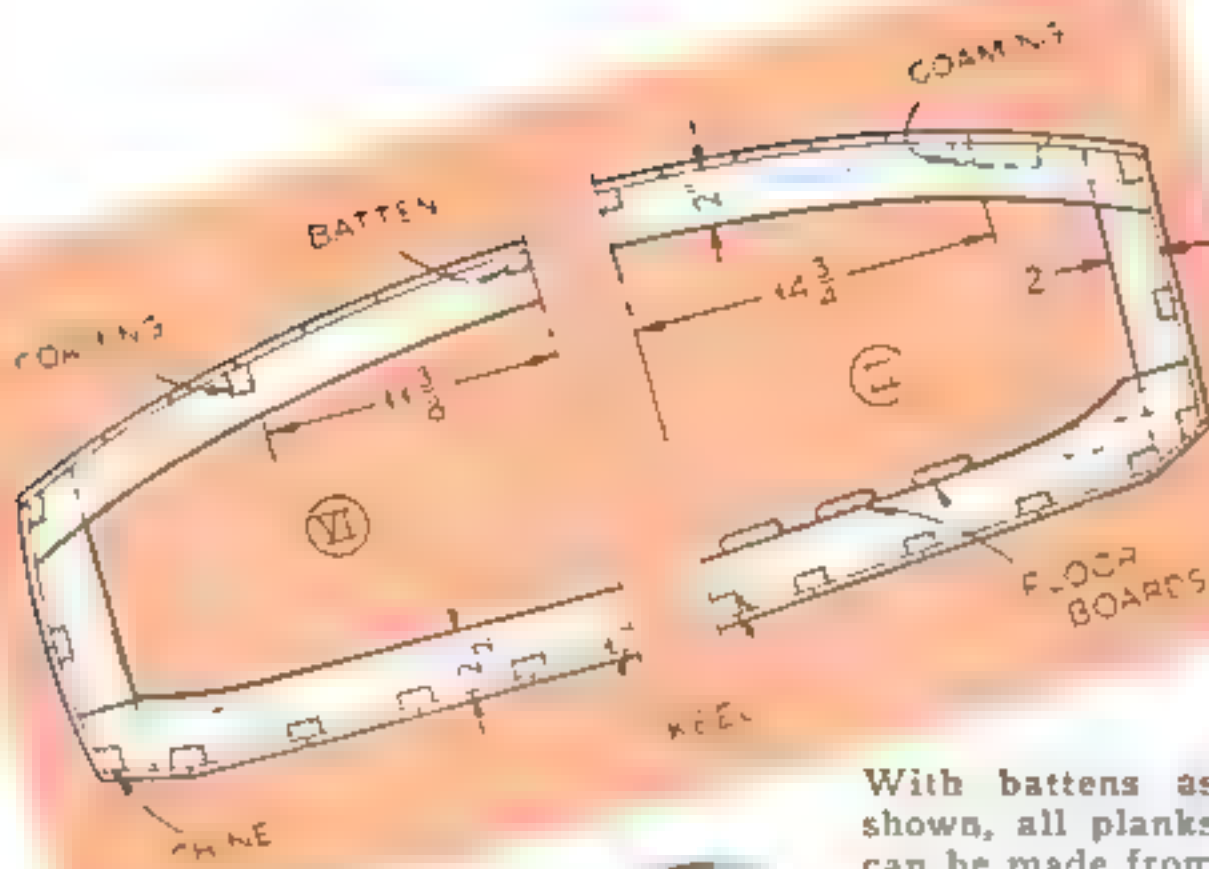
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(Please print very clearly)





With battens as shown, all planks can be made from 6-in. wide boards. Right: The boat is turned right side up before the upper side planks are added. Below: Fitting last bottom plank on chine



**B**EFORE starting to plank our new high-speed sport runabout (P.S.M., April '37, p. 77), cut small notches for a waterway on both sides of the keel and check the entire framework.

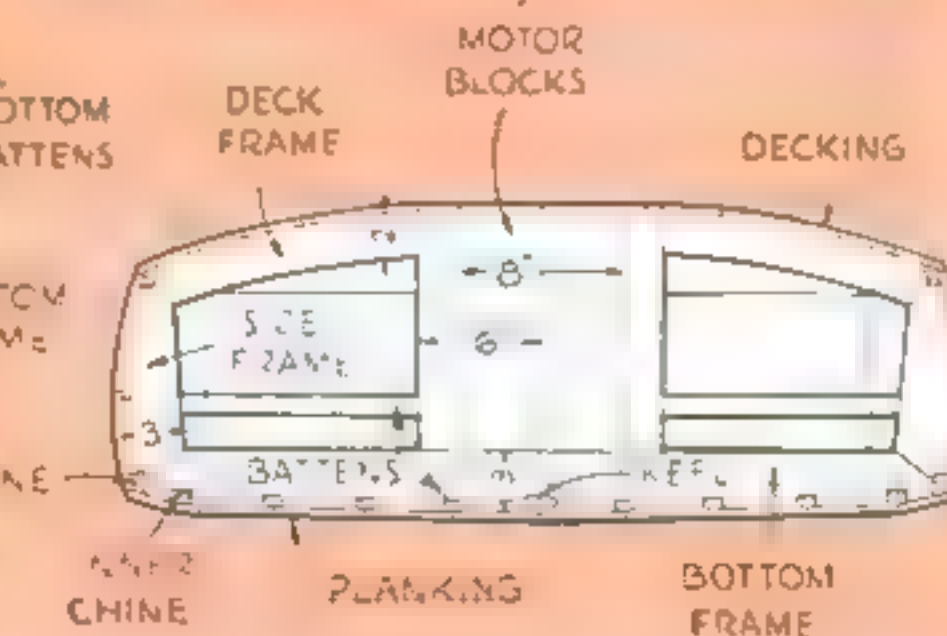
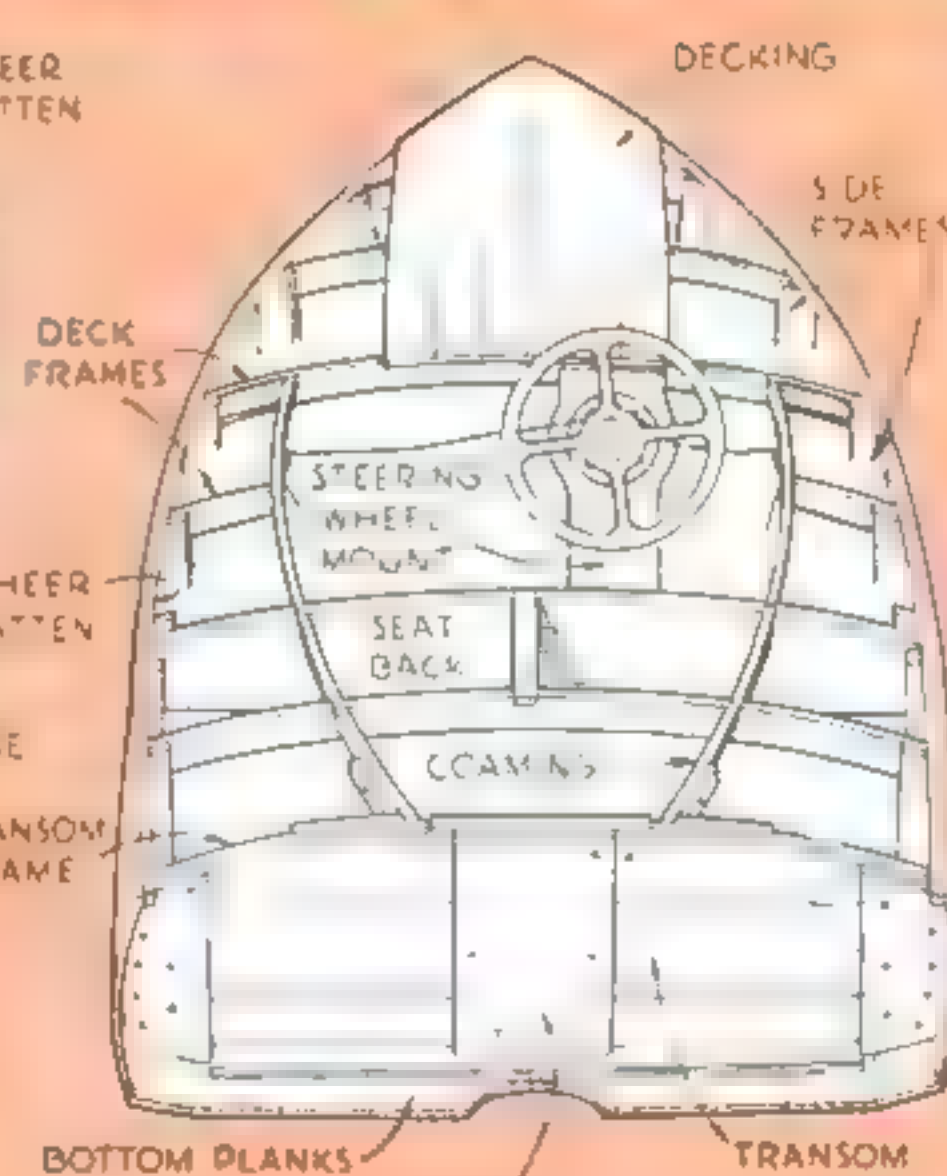
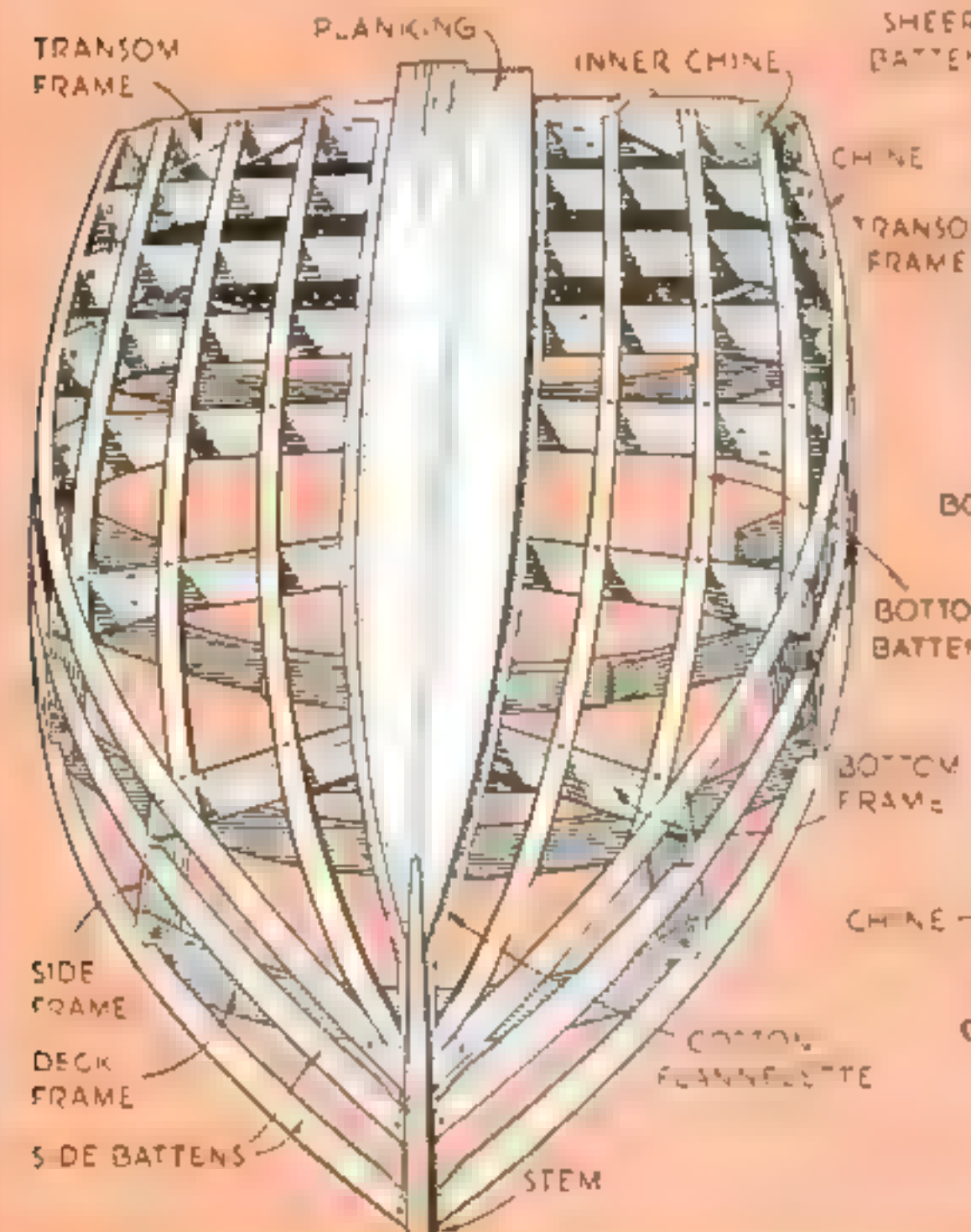
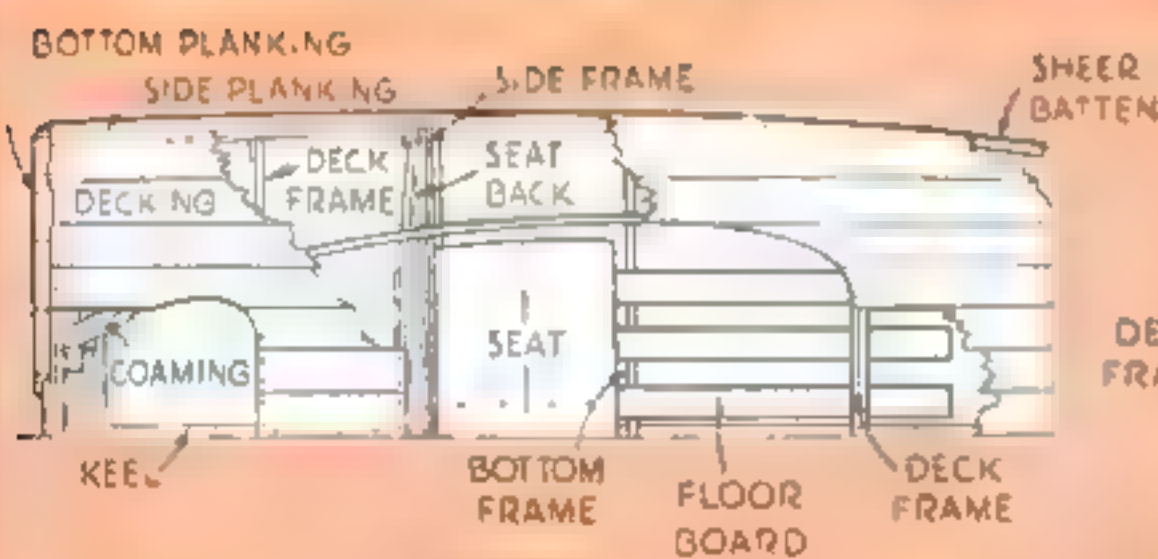
Fit all planks so the seams are exactly centered over the battens. First clamp them in place, mark from the inside along the battens, then add half the batten width to each side of the plank. A pencil compass helps in fitting.

Leave the planks below the water line open about 1/16 in. for swelling. Make the third plank out from each side of the keel in two pieces to get a straight enough grain. At these joints use butt blocks as thick as the battens. After first three bottom planks on each side are in place, put on the lower side planks and dress them down. The last two bottom planks merely lap over them.

Just before screwing down each plank, coat with marine glue all joints that must be waterproof; then lay on a strip of cotton flannel, and apply glue to the cloth. To fasten a plank, first clamp it, then drill for the screws with a depth stop on the drill, and countersink enough to allow for covering with putty or seam composition. Screws may be left flush on sides and deck if the boat is to have a natural finish. Some planks will have to be steamed by the boiling-water method described last month.

Use flathead brass or galvanized screws as follows: (1) Into transom frame and stem, 7/8-in. No. 6, spaced not more than 1 in.; (2) into keel, chines, inner chines, frames, and all framework behind transom, 7/8-in. No. 6, about 1 1/2 in. apart; (3) into battens, 3/4-in. No. 6, spaced about 1 1/2 in. (except at bends, 7/8-in. screws may be substituted).

Before applying top side planks, set boat right side up on horses,



Cross Section at Transom



How to Add the PLANKING to Our New

*HIGH-SPEED*

# *Sport Runabout*

By

Willard Crandall

FROM A DESIGN BY  
Bruce N. Crandall



The decking is laid in 3-in. widths. Note how the bottom planks are cut 4 in. back of transom

temporarily removing the deck frames. Fit the breasthook and screw through battens with 1¼-in. No. 7 screws.

True up deck beams, bevel battens and planking along sheer, and bevel top of transom and transom frame. Put in the seat-back frame at any angle desired, fastening it at each side to small cleats screwed to the top battens. Apply coaming as shown; it is notched through seat back and frame No. 6 and fastened to transom frame and No. 3 with cleats. Use 1¼-in. No. 7 screws. Brace coaming to motor blocks with small angle irons fastened with 1½-in. No. 10 machine screws.

Notch the single deck batten into breasthook and frames, and fasten with 1¼-in. No. 7 screws. Paint the entire inside.

Lay the decking in 3-in. widths, most of which can be made by sawing a 6-in. plank in half. Paint each deck plank underneath and screw to breasthook, frames, transom frame, and sheer batten with ¾-in. No. 6 screws without using glue or flannelette.

Floor boards and steering-wheel brace are made from left-over frame material, and the

seat from planking. The steering wheel should be on the right side because the torque of most motors makes the boat tend to lean toward the left.

Sand the entire hull well. After the priming coat is on, cover all screws with putty, plastic composition wood, or seam composition. Apply at least two coats of marine enamel or spar varnish, or use two coats of flat paint and cover with one coat of spar varnish. To obtain a natural mahogany finish, apply either mahogany filler or mahogany stain and cover screw heads with mahogany-colored seam composition.

For the water line, set the boat level on an even floor and then mark all the way round the hull 4 in. up from the floor. Sheer and fender moldings should be ½-

in. half-round hardwood screwed to the battens with 1¼-in. No. 6 or 7 oval-head brass screws. A strip of ¾-in. half-oval brass, aluminum, or galvanized iron protects the stem. A fin about 2½-in. deep by 6 in. long or larger is necessary if a motor of over 4 h.p. is used. Bolt it to keel just aft of frame No. 3.

The steering outfit may be hooked up with the tiller line or cable running through cockpit or holes in top of transom.

The steering outfit is hooked up with two pulleys attached to coaming. For greatest speed, the transom should be as high as motor permits





## BERRY BOXES ASSEMBLED WITH PAPER STAPLER

MANY small berry growers buy knocked-down boxes of the square type and assemble them as required, usually with small tacks supplied for the purpose. This is slow, tedious work, and does not result in as strong boxes as might be desired. A much better way, in the absence of a special stapling machine, is to mount an ordinary office stapler on a wooden support as shown below. By holding the box with one hand and hitting the hinged arm on top of the stapler with the other, the staples may easily be made to pierce the thin wooden stock.—EMIL PEARSON.



## NOVEL WAY TO SCREEN CASEMENTS

CASEMENT windows that swing outward and do not have the modern type of geared opening and closing device sometimes offer problems in screening them. In the case illustrated, the difficulty was increased because there are plant shelves across the windows, making it impossible to hinge the entire screen.

Frames were built to fill all but 1 ft.

at the bottom of the windows, and these were fixed permanently in place. Small frames were then made to fit the remaining spaces at the bottom and were hinged to the lower rails of the large screens. A small glass knob and a spring catch of the barrel type were placed on the lower section of each screen so it can be raised when necessary.—H. O. BUMANN.

## MAKING GARDEN TOADSTOOLS FROM CONCRETE

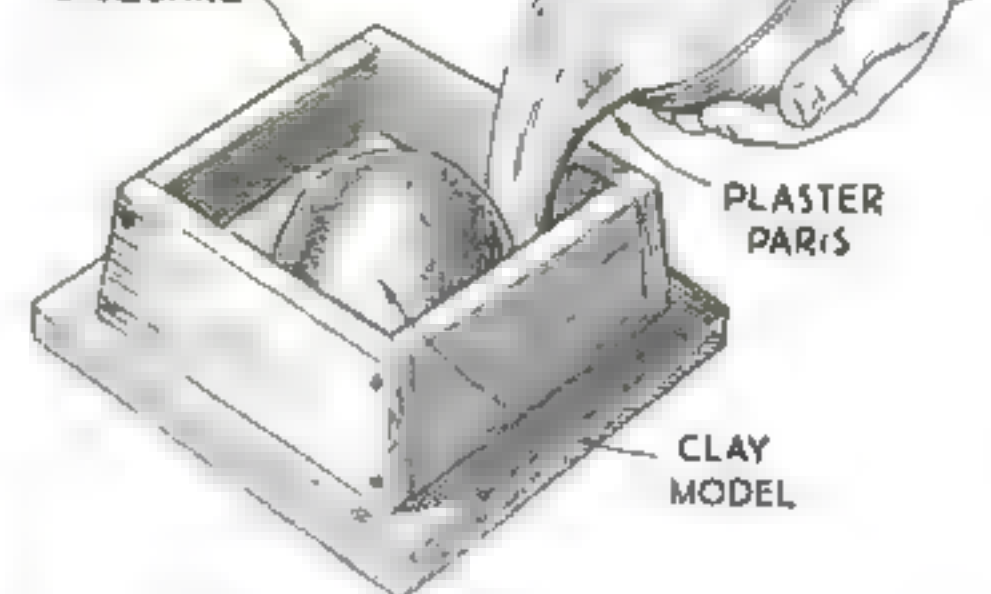
DECORATIVE artificial toadstools may be made at trifling cost. Model just the top of a toadstool, a little larger than a real one, from a handful of modeling clay. Set this on a board, flat side down. Build a bottomless box or fence of thin wood and set it over the model. Paint the model lightly with clean motor oil.

Into an old dish pour about enough water to equal the capacity of the wooden box, and stir plaster of Paris into the water until it begins to thicken. Pour the mass carefully over the model and fill the

box until level with the top. Let the plaster set for half an hour. Then turn the box over, pick out the model, open a corner of the box, and remove the mold.

When several molds have been made and dried, coat the top and inside evenly with shellac. It is also necessary before each cast is made to oil the cavity. The mixture for the toadstools is one part white sand, one part white Portland cement, and one part unslaked finishing lime. Mix with water to a fairly thick consistency and fill each of the molds level.

BOTTOMLESS  
WOODEN BOX  
1/4" x 2" HIGH x  
6" SQUARE



To prepare the mold, plaster of Paris is poured over a clay model of a toadstool top

Make the stems from pipe of the nominal 1/2-in. size (about 3/4 in. in outside diameter). When the cement mixture has set a little, stand the stems up in the center of the toadstools and use a putty knife to work around the underside, cutting ribs in wagon-spoke style. Let stand until the cement is hard; then pick the toadstools out of the molds.

Shape by hand or mold a little mound of ordinary cement just wet enough to hold together, and press the lower end of the stem into the center of this. Rest the top against a brick or other support to hold the toadstool upright until dry. Let the pieces season in a damp place for at least a week.—DICK HUTCHINSON.



Toadstools, finished and unfinished. The undersurface is painted a yellowish pink with a mixture of chrome yellow and red; the top and stem, a toadstool brown with white tinted with a little burnt umber





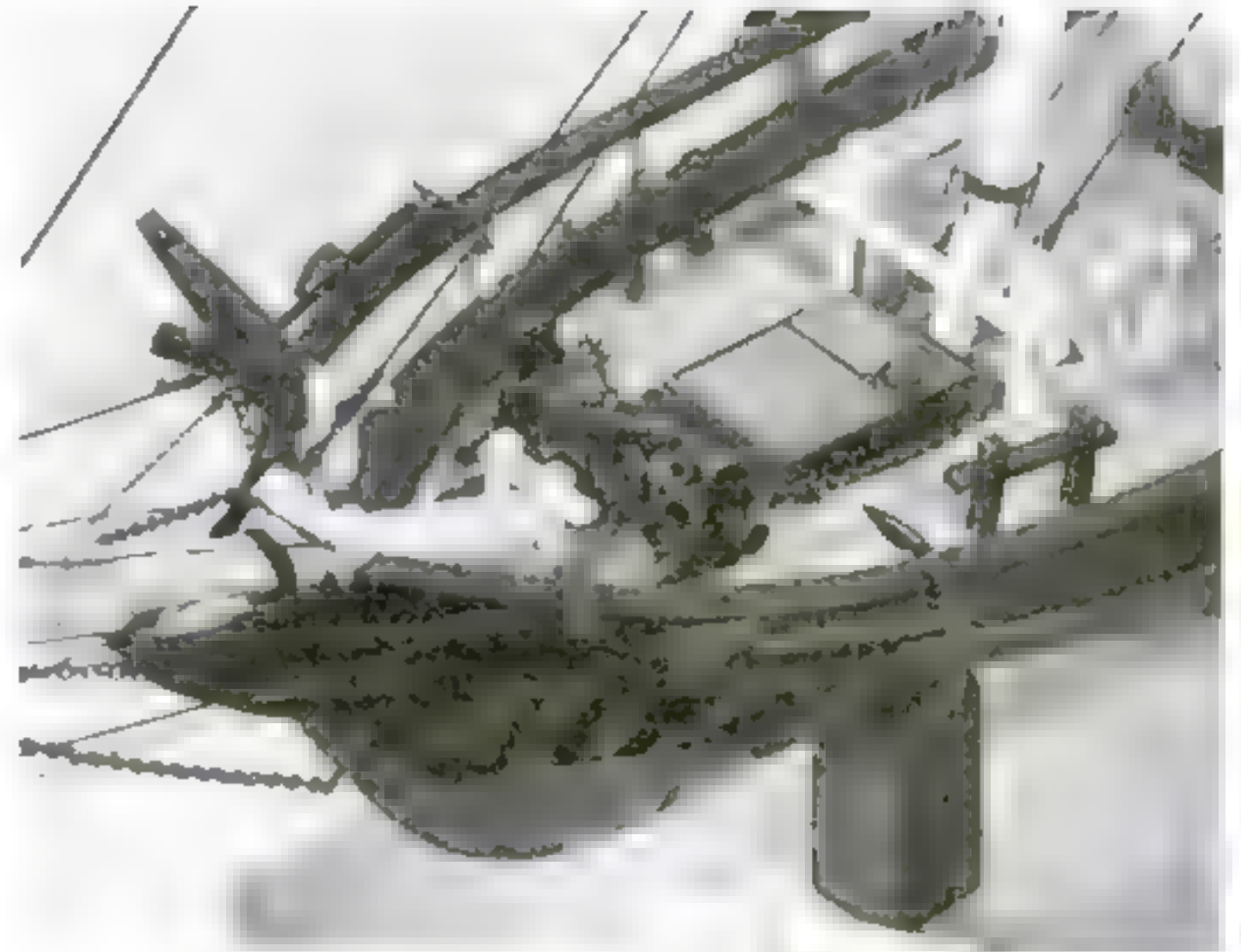
# WE FINISH THE Deck Work

## ON OUR MODEL OF THE BRIG *Malek Adhel*

By Capt.  
E. Armitage  
McCann



The 1/16-in. thick deck is made in two halves to simplify the task of fitting it accurately. The plank seams are marked with a hard pencil



Bow view showing catheads, bowsprit bitts, windlass, forward hatch, mooring bitts, and topsail sheet bitts and fife rails at mast. Right: The rudder and lettering at stern

**T**HOSE who are building our new ship model, the brig *Malek Adhel* of New York, should now be well along with the hull if they have followed the instructions given in the two previous articles of this series (P.S.M., Mar. '37, p. 77, and Apr., p. 92).

Outside the cheek knees previously described are the trail boards. These extend from the beak end to abaft the hawse holes and lie against the cheek knees. Not more than 1/16 in. thick, they are cut and bent into position. The cheek knees are tricky to make, so some builders may prefer to fix the trail boards first and fill in behind with plastic material.

The hawse holes for the anchor cables are 1/8 in. round. They pass up through the trail boards and through the deck at an angle (see the deck plan on page 78, March issue).

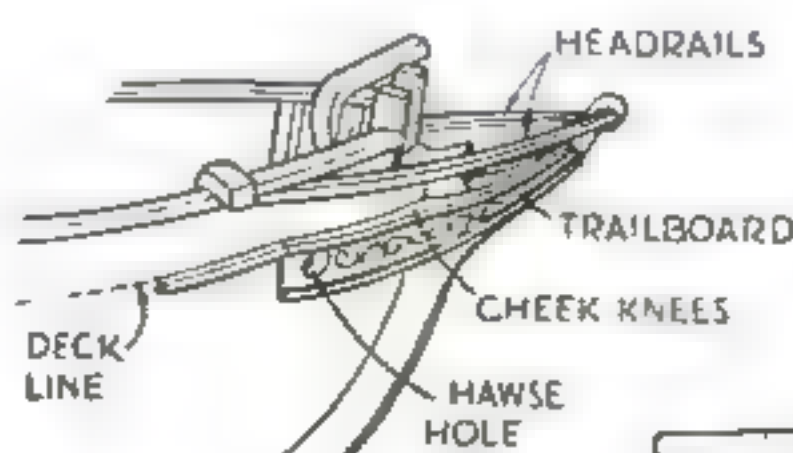
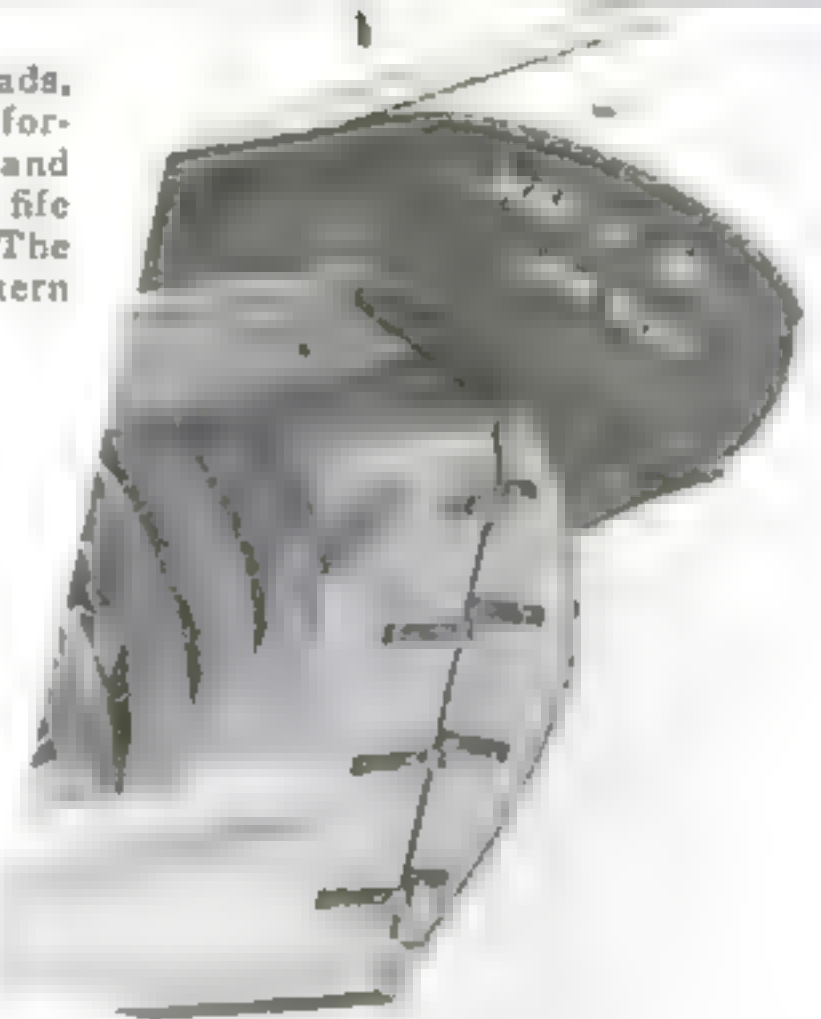
The rudder is of the plug-stock type, as shown. It is fitted with four sets of gudgeons and pintles in the usual manner. Note that the sternpost has to be cut into at the top to allow the rudder trunk (hole) to be set with its center in line with the edge of the sternpost. The rudder trunk cuts through the edge of the waterway, so a small piece similar to the latter should be nailed down to surround the hole completely. The top of the rudder stock is cut square for the tiller and extends 3/4 in. above the deck.

The channels, to spread the rigging, are a full 1/8 in. thick at the hull, tapering to almost half that, with the upper surfaces level. Notches are cut in their edges to take the deadeye straps. The two eyebolts on the channels should be placed before fixing the channels and their ends turned up underneath because they have to bear a strain. The chan-

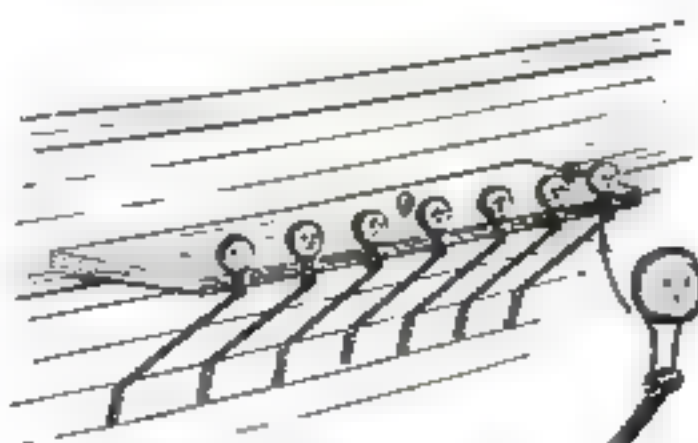
nels should be nailed through to the waterways.

Merchant ships as a rule have no inner lining to their bulwarks so a covering board is needed to cover the space between the waterways and the bulwark planking. This is a strip, cut to shape at the bows and bent in elsewhere, a scant 1/16 in. thick by 1/4 in. wide. It has to be notched to fit closely around the timberheads.

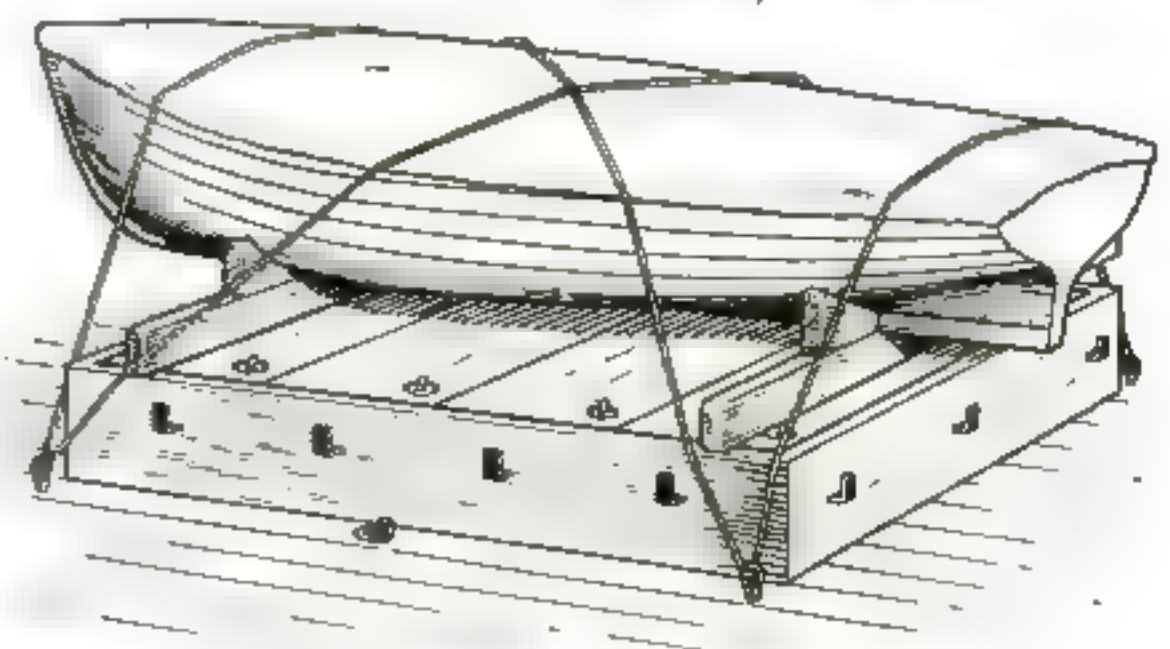
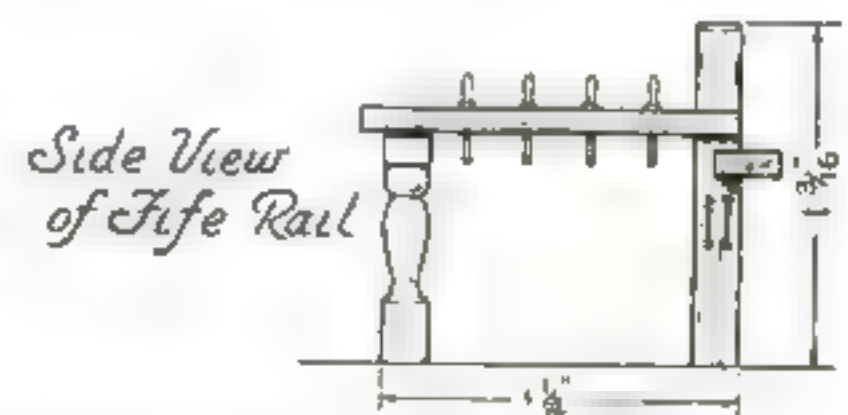
The deck planks should be from 1/12 to 1/10 in. wide by about 1/16 in. thick. They can be laid plank by plank, but this seems a lot of unnecessary work. I found it easier and neater to lay the deck with two pieces of light-colored wood, or *(Continued on page 106)*



Detail of Bow



Detail of Channel



Main Hatch and Boat

Sketch to make clear the arrangement of trailboards and headrails; a channel, showing how it must be slotted for the deadeye straps; the main hatch and boat, and a detail of the fife rails



# TIME-SAVING KINKS FOR MOTORISTS

## Garage Doorstop Is Foolproof

A GARAGE door that blows shut while the car is entering is not only a nuisance, but can cause considerable damage as well. This doorstop is dependable, even in a strong wind, and easy to operate. It consists of a piece of one by two-inch pine pivoted near the bottom of the door, with a screen-door spring arranged to hold the end firmly against the ground. When the door is to be closed, the strip is held in the "off" position by a wedge-shaped wooden block.—A. J. V.

## Piece of Rubber Hose Protects Spark Plug

WHEN a wrench slipped and broke a spark-plug insulator while I was tightening one of the cylinder-head nuts on my car, I decided to find a way of protecting the rest of the plugs. A piece of half-inch garden hose proved to be the best answer. It is split and slipped over the spark-plug porcelain, protecting it from damage. The protectors can be left on permanently.—A. W.

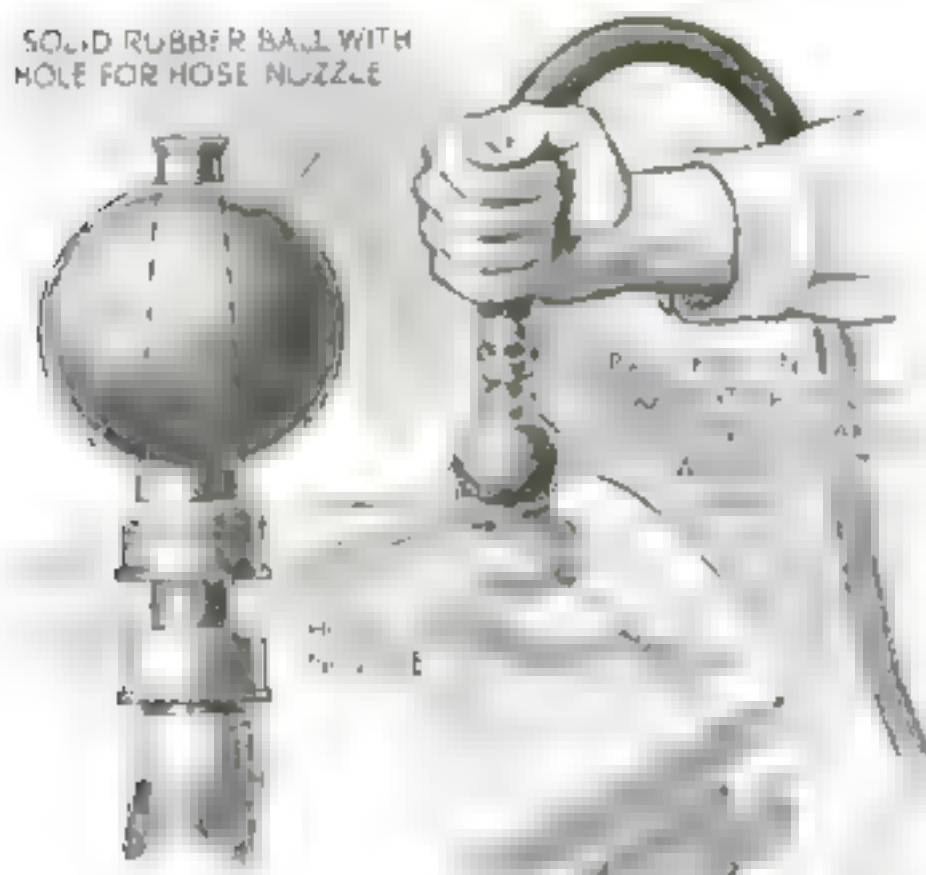


SMALL  
PIECE OF  
1/2" GARDEN  
HOSE



When the doorstop is moved to the "off" position, the wedge-shaped wooden block serves to hold it in place, as shown by dotted lines

SOLID RUBBER BALL WITH  
HOLE FOR HOSE NOZZLE



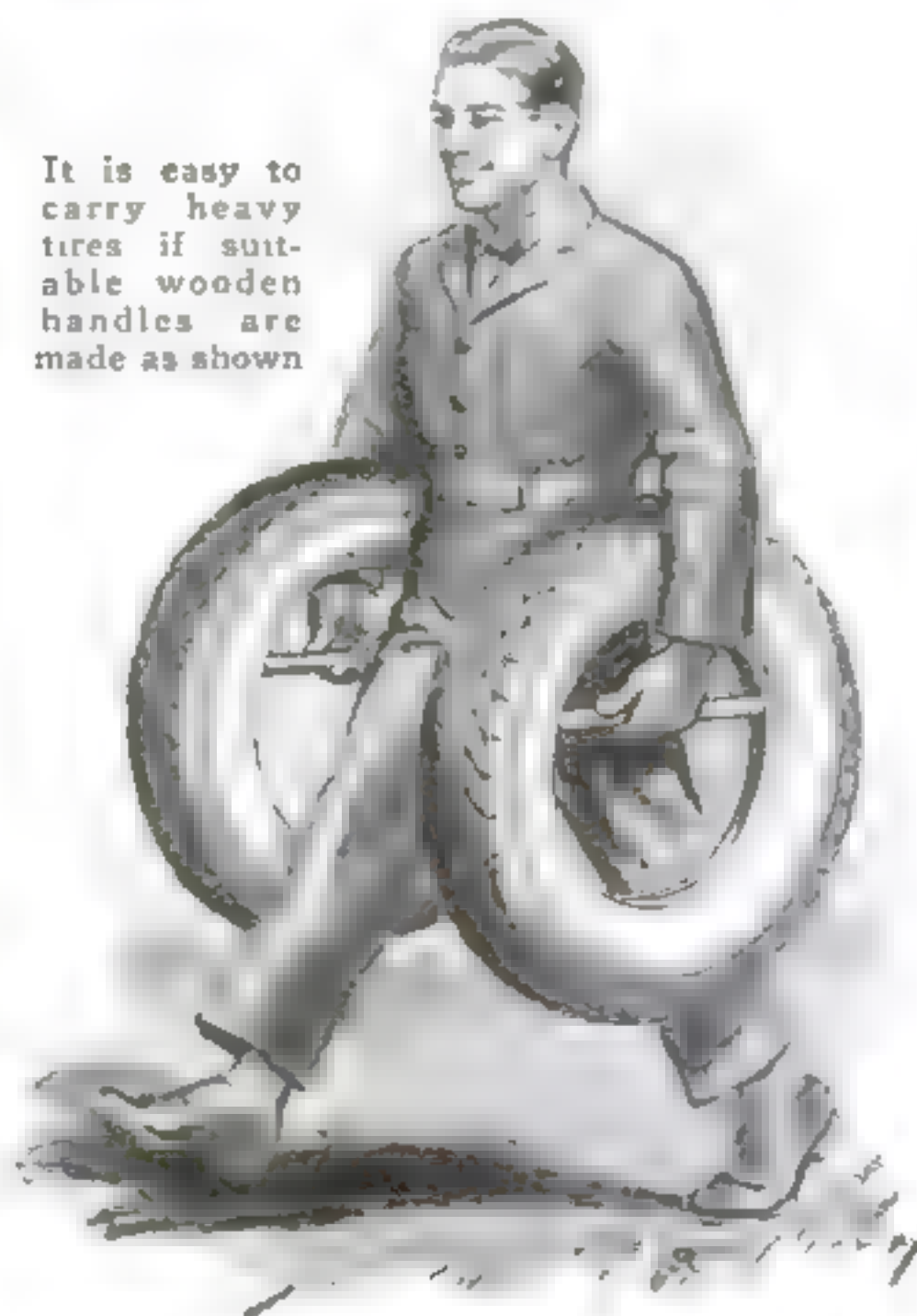
## Rubber Ball Is a Help In Flushing Radiator

PRESSURE-FLUSHING of a car's radiator is easy if a fairly large, soft, solid-rubber ball is placed over the hose nozzle. Just disconnect one of the hose connections to the engine, press the ball down against the opening, and turn on the water. The ball will act as a protector to keep the nozzle from being dented if it is left on permanently.—J. D.

## Tires Carried Easily With Wooden Handles

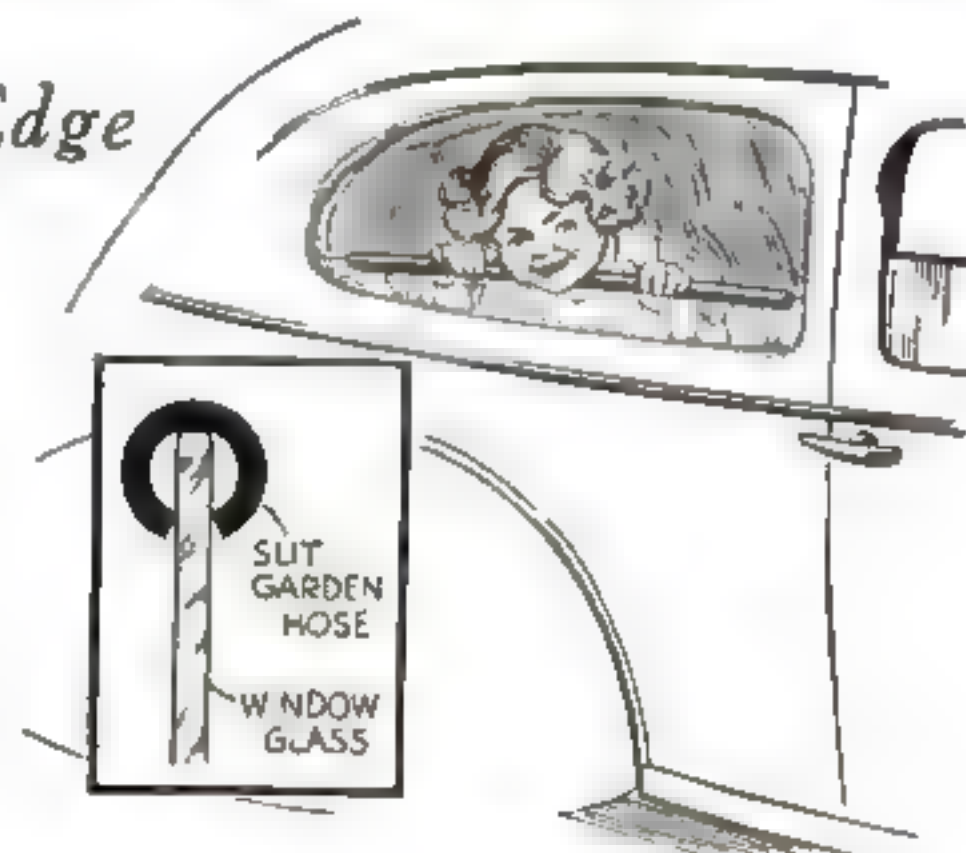
CARRYING two automobile tires is something of a task, unless you know this kink. Cut a broomstick, or other piece of wood, for each tire, long enough to fit inside about one third of the way down, and use it as a handle. The tires can then be carried for comparatively long distances without fatigue.—A. H. W.

It is easy to  
carry heavy  
tires if suit-  
able wooden  
handles are  
made as shown



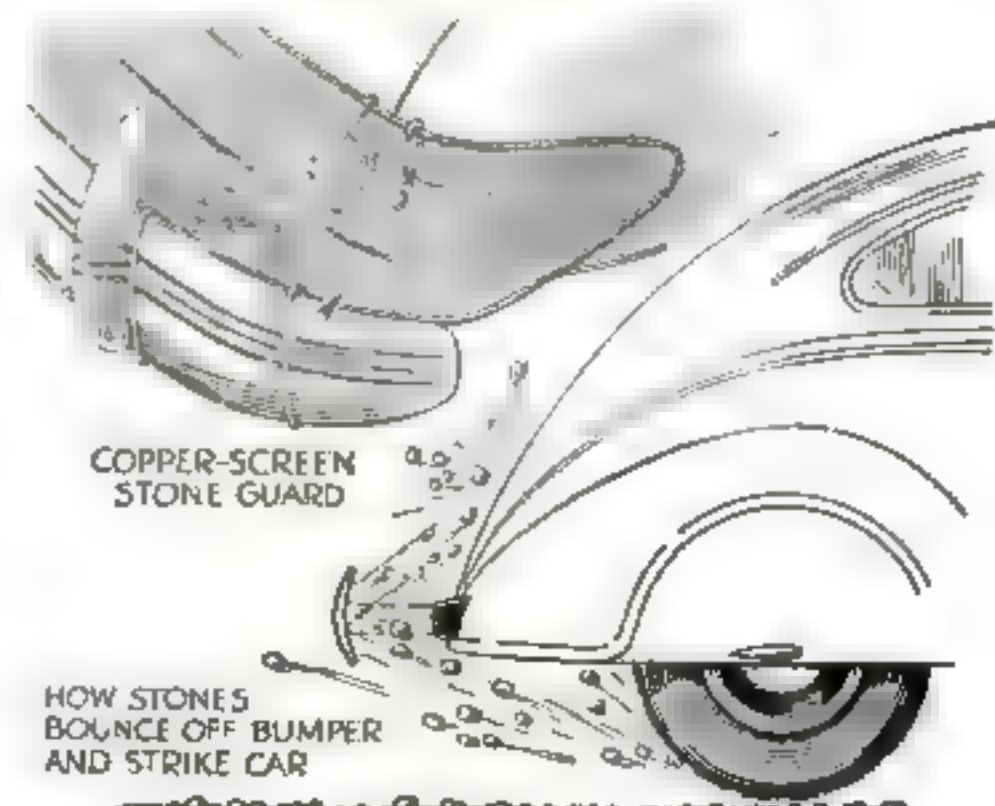
## Guard for Sharp Window Edge

CHILDREN, riding in the back seat of a car, often sit with their chins resting directly on the bare edge of the glass, and if a bump is encountered, they may receive a painful injury. A strip of garden hose, split down one side and slipped over the window will prevent such an accident. It also protects the glass, taking the shock if struck with a toy or other object with which the youngsters may be playing, and preventing the possibility of breakage or chipping.—W. H.



## Screen of Wire Netting Protects Car's Finish

A PIECE of copper screen, filling the entire space between the rear bumper and body of a car will prevent flying stones from bouncing off the bumper and ruining the finish. The edges should be soldered to prevent raveling.—B. K.



COPPER-SCREEN  
STONE GUARD

HOW STONES  
BOUNCE OFF BUMPER  
AND STRIKE CAR

This piece of copper window screening keeps small stones from damaging the car's finish



# IT COSTS NO MORE TO USE GENUINE FORD PARTS

*—But see what it means!*

Most Genuine Ford Parts cost no more than parts that are not genuine. That's because of Ford facilities, Ford resources, Ford large-scale production. But regardless of price, Genuine Ford Parts are economical to use because of the extra quality, the extra precision of manufacture, the extra long life they provide.

Consider these facts: All Genuine Ford Parts are made of the highest quality materials. The tensile strength of the steel in Genuine Ford Springs, for example, equals 200,000 pounds per square inch. At 31 points in a Ford V-8 Engine, the precision requirements are equal to those of a fine watch. In manufacturing Genuine Ford Pistons, diameters are held to a limit of variation of two-thousandths of an inch. Ring-groove widths are held to one-thousandth of an inch variation. And piston-pin holes must not vary more than three ten-thousandths of an inch.

*Genuine Ford V-8 Piston Rings. Complete set of 16 compression and 8 oil-regulating rings, \$1.90.*



These are but a few typical examples of the care used in making all Genuine Ford Parts.

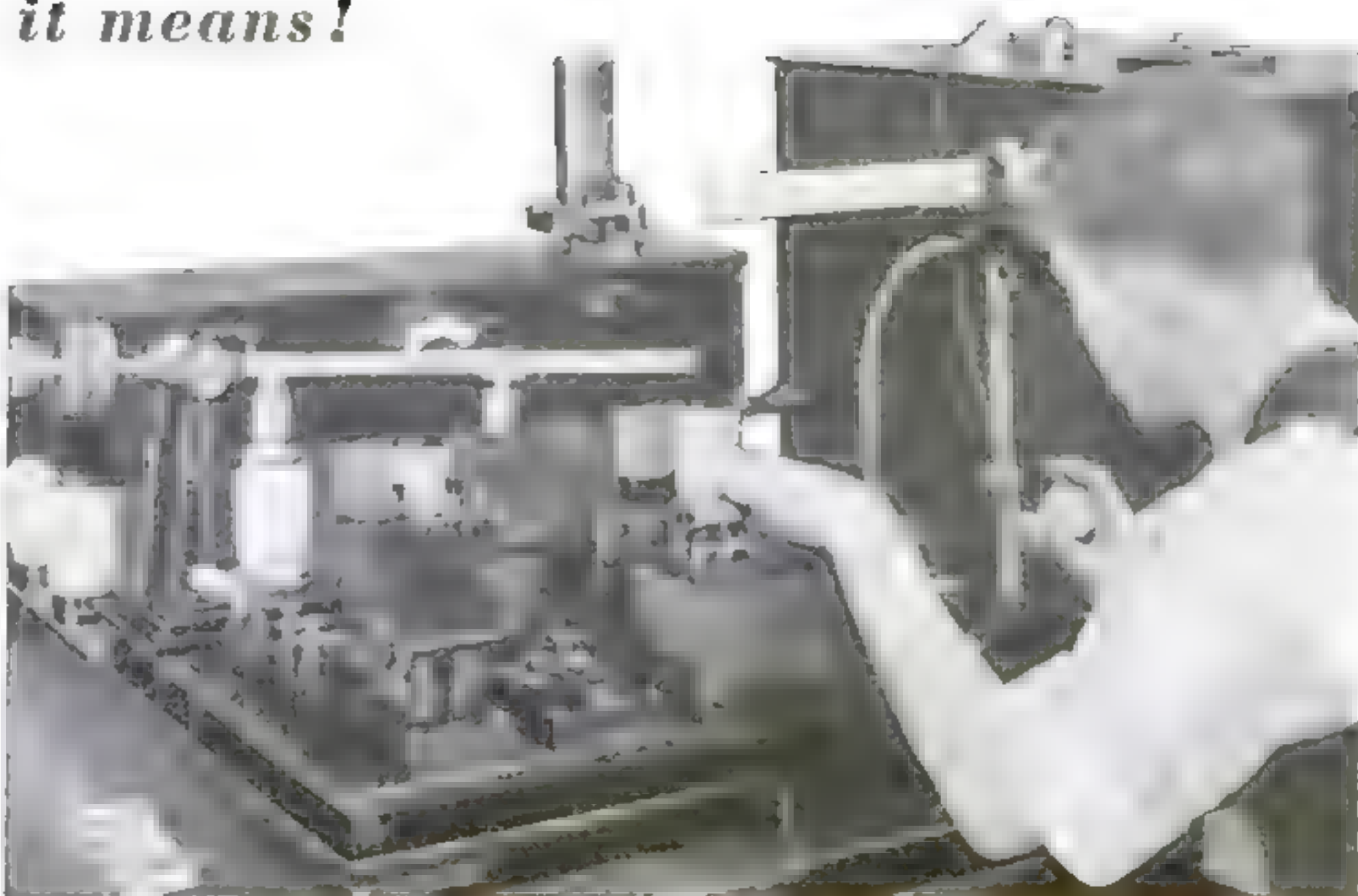
In many ways, it pays to use Genuine Ford Parts. It pays in better performance, in longer

performance, in the satisfaction you get in knowing that behind Genuine Ford Parts is an organization interested in the performance of its cars and trucks over the years.

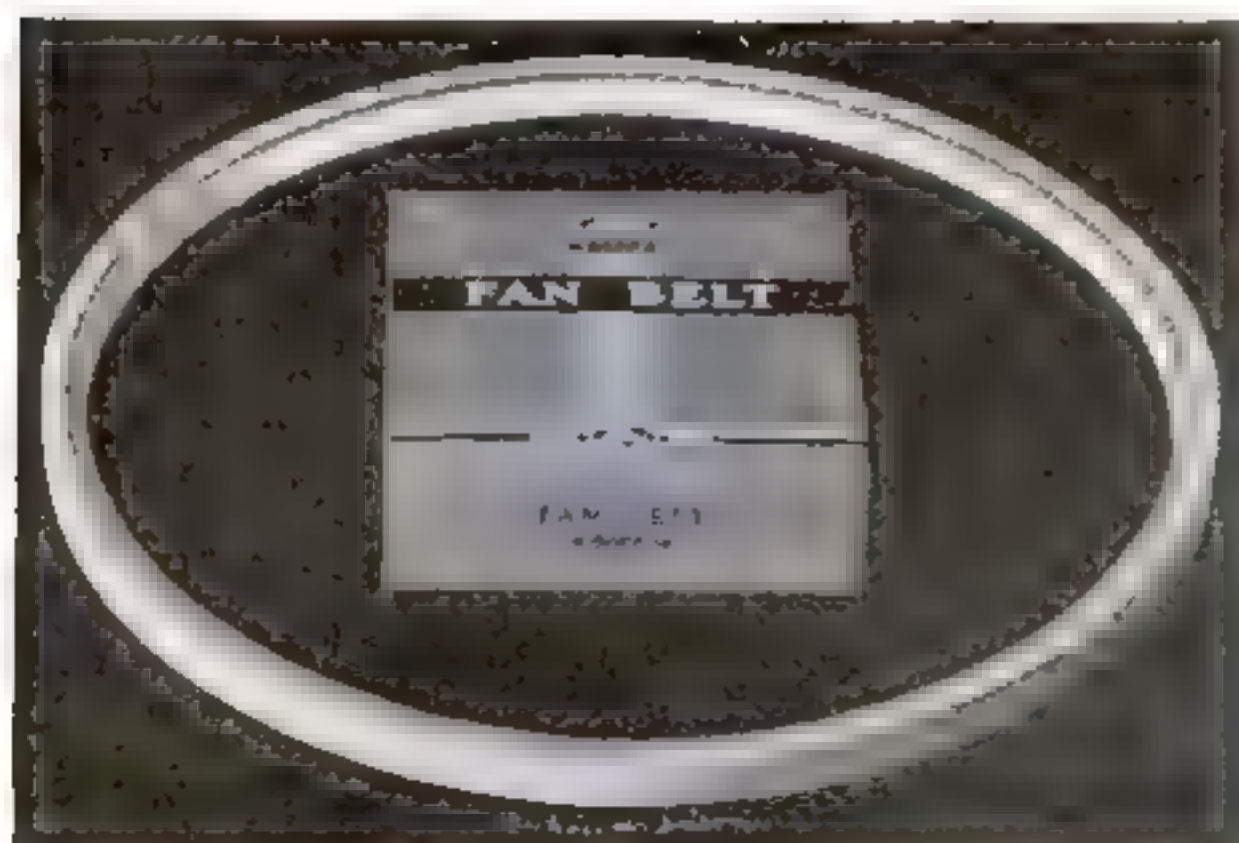
Genuine Ford Parts may be obtained at all Ford dealers or at any garage that displays the sign, "Genuine Ford Parts."

**FORD MOTOR COMPANY**  
DEARBORN, MICHIGAN

*Prices subject to change without notice.*



*Constant tests and inspections insure the quality of Genuine Ford Parts. Here an operator is checking the resistance of condensers on an insulating test bridge.*



*Genuine Ford Fan Belts, like many other Genuine Ford Parts, are packaged for your protection. Ford V-8 car fan belts are only 50c to 60c, according to car model.*

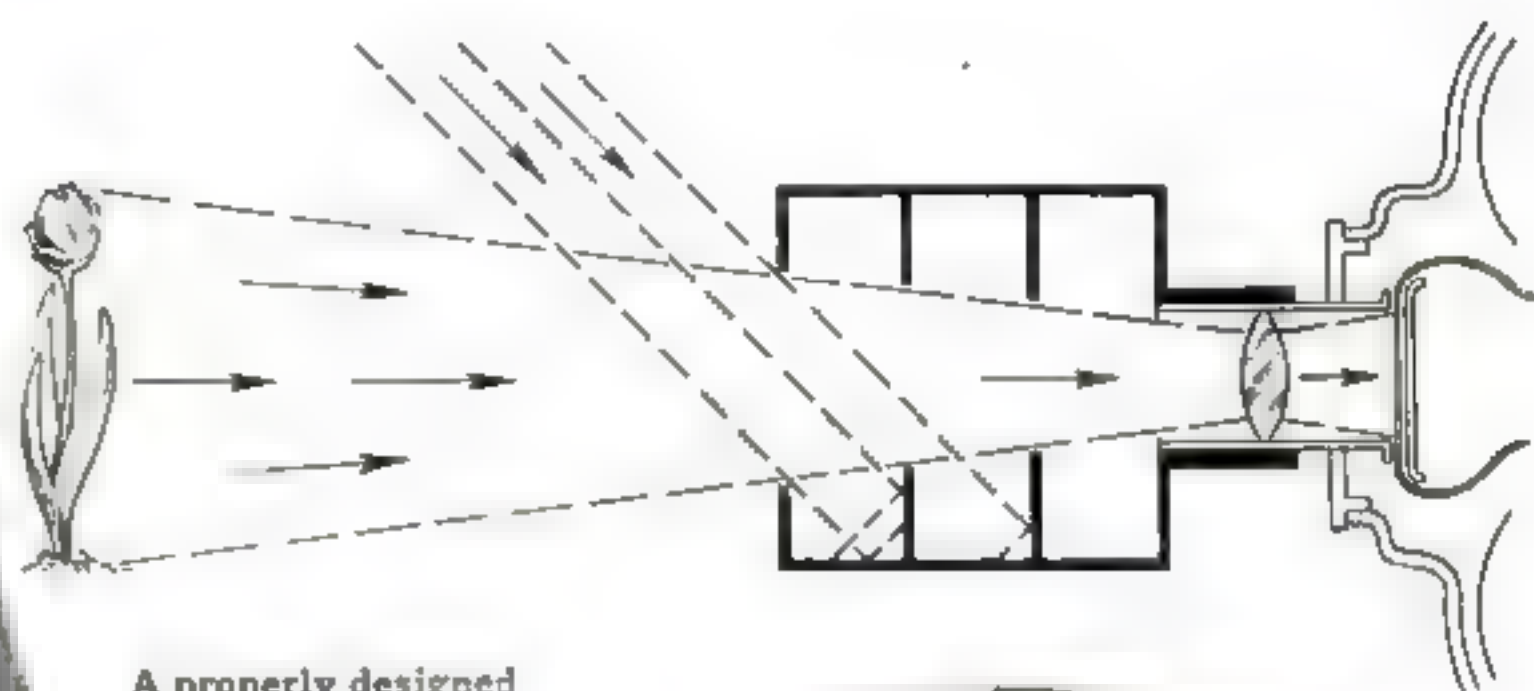


*This kit contains all of the necessary parts to do a complete job of spindle rebushing. Price complete, \$2.70.*

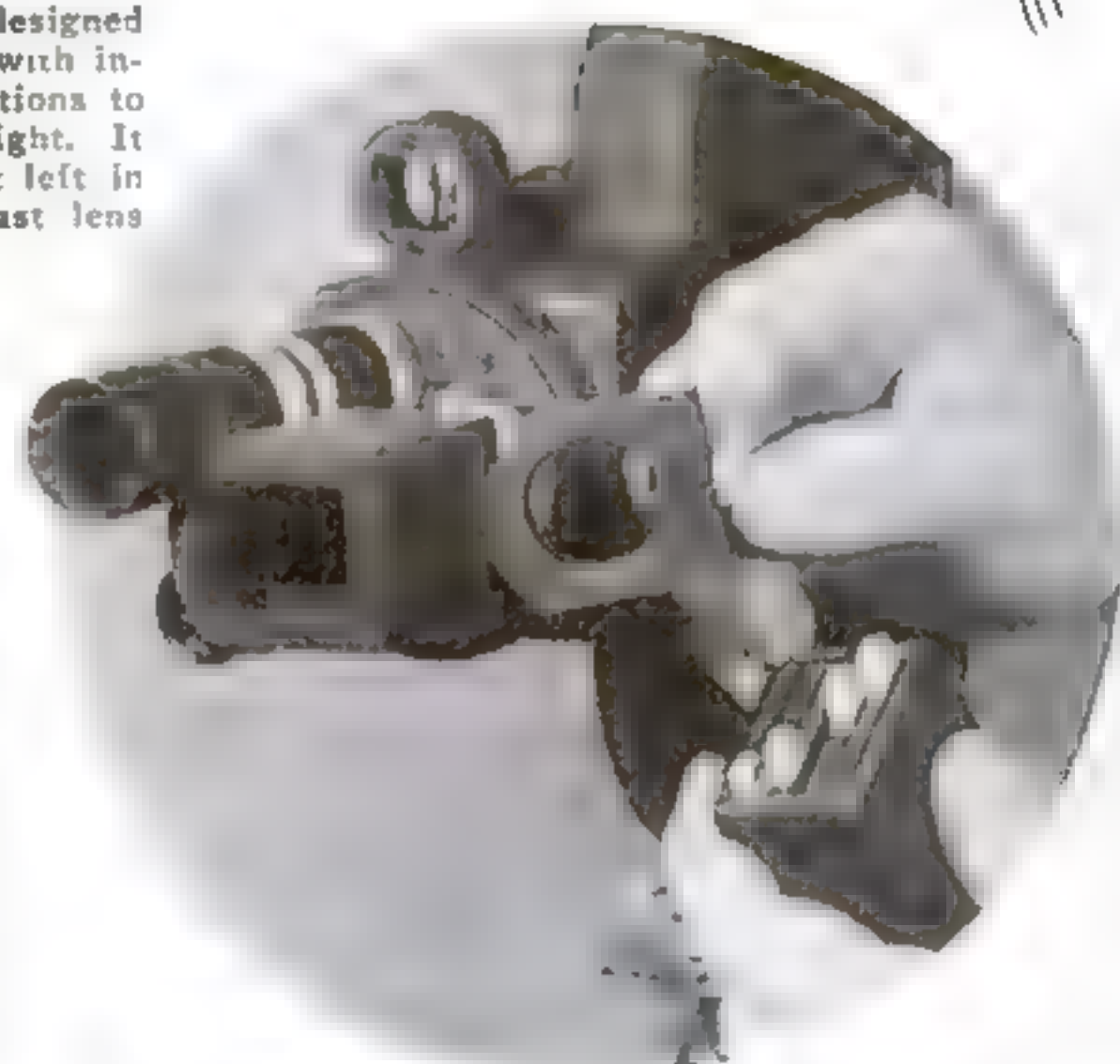


# SIMPLE WAYS TO IMPROVE Home Movies

*By Frederick D. Ryder, Jr.*



A properly designed lens shield with internal partitions to trap the light. It is shown at left in use on a fast lens



The shield can also be made to hold filters—in this case, gelatin disks set in pieces of cigar-box wood

**Y**OUR friends, when they view your home movies, do not expect to see pictures that rival in technical perfection the productions shown at the local movie palace. However, this is no excuse for showing movies so glaringly faulty that they annoy your audience. Most defects can be avoided very easily.

Every instruction book cautions against wobbling the camera, swinging it like a fire hose from subject to subject, and cutting each scene so short that the eye can hardly follow the rapid change of view. Other troubles are dealt with only vaguely if at all.

Take proper lens shielding, for example. We are cautioned not to shoot directly into the sun and to shield the lens from direct sunlight. That is excellent advice, but it doesn't go nearly far enough.

Theoretically, every lens requires shielding for every picture taken under ordinary conditions. Practically, the only movie lenses that give better screen results when additional shielding is provided are the fast lenses and that, in movie work, means having larger stops than  $F/3.5$ . The faster the lens, the more careful shielding it needs. Furthermore, using a small stop in a fast lens does not eliminate the need for shielding.

You will find it easy to work out the dimensions of a shield that will do the trick. Study the diagram and also the shield shown on an  $F/1.5$  lens in the two photographs above. Note how the internal partitions trap the light and prevent reflections inside the shield itself. The longer the shield, the more unwanted light can be cut off, but practical considerations limit the length to about 2 in.

It is easy to determine the size opening that will give maximum shielding without cutting off any of the picture. At a point from 6 to 10 ft. from the lens, locate with the aid of the finder the limits of the picture area. If you can see the whole surface of the front element of the lens from each one of the four corners of the picture area through the rectangular opening of a cardboard shield placed 2 in. in front of the lens, there will be no cutting off of the picture. If you cannot see the whole of the lens, then you must either move the cardboard closer to the lens or enlarge the rectangular opening. The relatively smaller openings of the inner positions can be determined in the same way. When you have these figures, a shield can be made up out of thin metal or cardboard. It should be painted

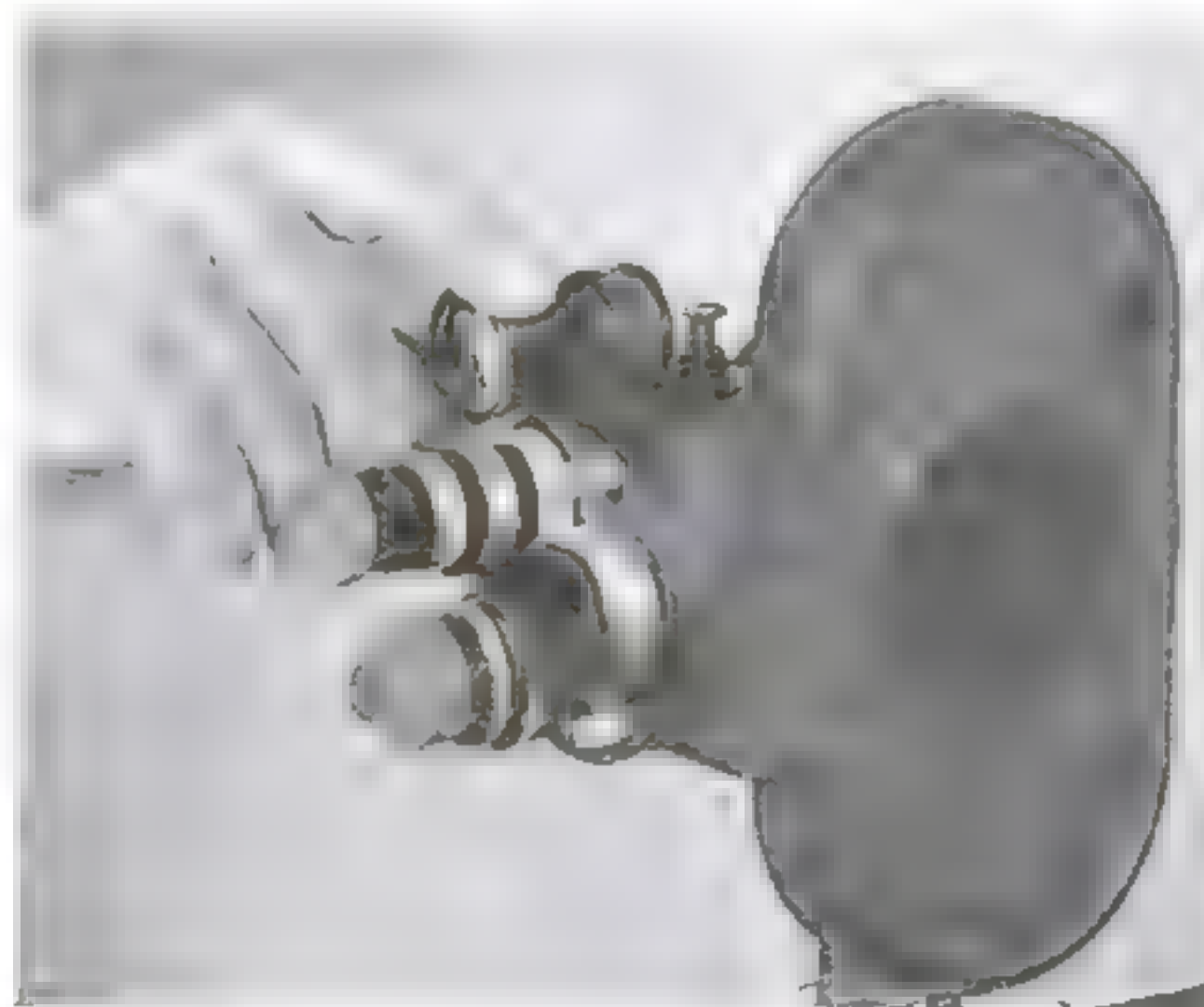
flat black inside. The outside finish is of no importance.

With a lens shield like that shown, you can shoot in any way you want without regard to the position of the sun so long as the sun itself is at least 15 deg. beyond the edge of the picture area.

While you are about the job of making a good lens shield, you might as well solve another problem that bothers the amateur cinema fan. That is the question of filters.

Filters of various types are absolutely necessary in all black-and-white movies if you wish to get good cloud effects in your outdoor shots, whether you use a fast or a slow lens. Optically nothing is better than the simple gelatin filters sold in 2-in. squares for about fifty cents apiece. From one square you can cut four 1-in. circles large enough for use with a 1-in.  $F/1.5$  lens. With reasonable care, a gelatin filter will last for a year or two.

If you make a slot at the rear end of the lens shield, you can slide into it a simple filter holder made of cigar-box wood or thick cardboard. This will center the gelatin (Continued on page 108)



An inexpensive supplementary lens is used to adjust the field of view of the finder to suit a wide-angle or other special lens





Old  
Bill

SAYS:

**I**F A WIRE drill runs out in the chuck, it's no reason for walloping it with a wrench or hammer. The drill is either sprung or burred, or the chuck requires attention.

In making drawings for shop use, remember that they should help the mechanic visualize the part, whatever it may be, in the shortest possible time.

To make a set of parallels for a magnetic chuck, machine one with six legs spaced to suit the magnetic field, and the other with five legs to make contact between those spaces.

Large plug gauges are now economically made by pressing steel sleeves with walls from  $\frac{3}{8}$  to  $\frac{1}{2}$  in. thick over aluminum bodies.

Since the end of a micrometer spindle wears down much more quickly than the opposite contact point, precision can be restored by removing the spindle and lapping it on a cast-iron plate. Insert the spindle through a piece of soft steel drilled and reamed to the required diameter and squared on one side. Use a fine-grade lapping compound applied with the end of a finger.

By stoning carefully the cutters of a boring bar, a grinding operation may often be avoided.

In the absence of a sine bar, one can set work with reasonable accuracy to any angle desired for grinding, milling, and drilling by inserting two  $\frac{1}{2}$ -in. steel pins in an angle iron, 5 in. apart and on a perpendicular line, and using gauge blocks with them.

## MAY Suggestions For the Handy Man

Don't put off making those needed repairs and improvements around your home. Spring is the ideal time to do them. A check list of suggestions follows:

- Paint porch floor and steps.
- Install an incinerator.
- Modernize the laundry equipment.
- Install ventilating fan in kitchen.
- Beautify the grounds with fences, gates, arbors, and the like.
- Add dormer window or skylight to make attic more useful.
- Repair existing roof; restain or apply preservative to wood shingles.
- Inspect storm sash and repair if necessary before storing for the summer.
- Recondition driveway with new crushed stone surface. Reset brick or flagstone walks where lifted by frost.

## CHAMPIONS AT 1936 INDIANAPOLIS 500-MILE RACE



### ECONOMY DEPENDS ON SPARK PLUGS

# YOU CAN DEPEND ON CHAMPIONS

Modern engines offer outstanding economy combined with top-notch performance, that can and should be lasting if a program of periodic servicing is adhered to. So often both performance and economy drop off from new car levels, simply because spark plugs that are worn out are prolonged in service, or inferior quality spark plugs are used. Champion Spark Plugs provide such outstanding performance that practically all victorious racing drivers for the past 13 years have insisted on them. In the 1936 Indianapolis 500-Mile Race, gasoline limitations made it imperative that maximum performance be combined with maximum economy. It is significant that the first 10 to finish all used Champions. Louis Meyer, the only three time winner of this great event, is pictured above setting a new track record using Champions. Maximum economy depends to an extraordinary degree on spark plugs, and the records prove that you can always depend on Champions.

### THE SPARK PLUG CHAMPIONS USE



CHECK AND CLEAN SPARK PLUGS WHEN YOU CHANGE OIL



# HELP WANTED



## MAKE THIS SHAVE TEST

Shaver... if you want to be helped to a better shave... just realize this all-important point: every man's skin (yours too!) tends to be either *oily* or *dry*. Mennen is the one manufacturer who has done something about it... by making *two* types of shaving cream. one to *remove* excess oil from the beard and skin, and the other to *conserve* oil. If your skin is *oily*, you need Mennen Lather Shave to wilt your oily whiskers and to flush out oil-clogged pores. But if your skin is *dry*, then you need Mennen Brushless; it not only wets your whiskers but also relieves the tightness, rawness and discomfort which go with dry skin; and it's a cream, not a grease.

You owe it to yourself to find out which Mennen Cream fits *your* face. Send 10c for the Mennen Skin Tester Kit, containing liberal demonstration sizes of 5 Mennen Products—including both Lather Shave and Brushless (as well as Skin Bracer, Skin Balm and Talcum for Men). Address Dept. PS2, The Mennen Co., Newark, N. J.

for

**OILY  
SKIN**

for

**DRY  
SKIN**



## NEWS OF HOMEWORKSHOP GUILD CLUBS

(Continued from page 89)



Members of the Inland Homeworkshop Club, Spokane, Wash., making tables for the blind

City (Okla.) Homeworkshop Club, and twenty-nine women were awarded prizes. Fifty-seven pieces of homemade furniture were on display. There were 100 guests present. At another meeting Fred Leach and Claude Keenan gave woodworking demonstrations.

Officers of the *Denver (Colo.)* Homeworkshop Club are F. E. Clay, president; W. B. Marquis, vice president; W. L. Freeman, secretary-treasurer; James J. Coughlin, Dr. C. W. Grauel, C. W. Reitsch, and J. F. Sherwin, governors. . . The Home Crafters Club of *Elgin, Ill.*, has completed plans for its annual exhibition the week of April 12. Moving pictures on the history of navigation and making a V-type engine were shown. . . Composed largely of skilled mechanics employed by an airplane company, the Passaic County Homeworkshop Club of *Hawthorne, N. J.*, has arranged to meet in a school until a more permanent meeting place can be established. . . Women members of the *Brockton (Mass.)* Homocraft Club have been making flowerpot wall brackets.

In order to pep up meetings, the *Edmundston (N. B., Canada)* Hobbyists have chosen a project and divided up the operations so that each member has a definite job to do. The first article to be built under this system is a tool chest, which will be awarded to the person who draws the lucky card.

James L. Gillard has been elected president of the Lakeside Homeworkshop Club of *Muskegon, Mich.*; Harold Taylor, vice president; Floyd L. Lewis, secretary-treasurer. Forrest Haines demonstrated wood turning. H. Scheidmantel was made club photographer. At the following meeting Dr. Gillard showed movies he had taken of the club. A demonstration on the circular saw was given by a local hardware dealer.

Photostats of the Guild charter presented to the *Ware (Mass.)* Homeworkshop Club were made by Edward Gosselin and given to all the members. Leopold Mozdierz has framed the original charter. A demonstration on how to bore a square hole with a bit brace and a 1-in. auger was given by him at the home of Donald Milligan. Rudolph Bouvier and Mr. Gosselin gave hints on model ship building.

Outfitting the club workshop, which is a room partitioned off from a large barn, has occupied the Niagara Homeworkshop Club of *Niagara Falls, N. Y.* Officers for the year are H. W. Stegman, president; R. Kletke, vice president; J. P. Montgomery, secretary; W. Kletke, treasurer. Several members are building boats at present. Six sets of small table games for the boys' recreation room were recently completed by the "Y" Craftsmans

Guild of *Victoria, B. C., Canada*. The dark-room and photographic laboratory are being enlarged to make room for a drying cabinet, new wash and developing tanks, and a printer. Maurice Pickering completed a lantern-slide tinting table. The club participated in the hobby show held at the Y. M. C. A.

M. O. Jackson demonstrated metal spinning for the *Crookston (Minn.)* Homocraft Club, and R. H. Cota exhibited fifty samples of foreign woods. Plans were made for an exhibit at the Red River Valley Farm Crop Show. John Benson made a beautiful inlaid frame for the club charter.

The Civic Homeworkshop Guild of *Fort Wayne, Ind.*, has concluded its radio series over station WGL. . . Officers of the *Saginaw (Mich.)* Homocraft Club are C. S. Kolb, president; M. Hedrick, vice president; L. E. Foglesong, secretary; E. Deford, treasurer; L. Sullivan, librarian; George Parent, T. J. Paquette, and the officers, governors. . . Paul Denis designed the layout for a model electric railway which the Cartier Homeworkshop Club of *Montreal, P. Q., Canada*, has started to build. . . "Paints, Their Origin and Application" was discussed by H. W. Russell at a meeting of the *Longmeadow (Mass.)* Homeworkshop Club. . . The *Cedar Rapids (Iowa)* Homocrafters recently heard a talk by Harry Hall on making fishing poles.

The *Lowell (Mass.)* Homeworkshop Guild has elected the following officers for this year: Cecil W. Crane, president; J. E. Trembly, vice president; E. Harnois, secretary; E. L. Talbot, treasurer; William A. Thompson, Walter S. Douglas, and Peter J. Gulesian, directors. A report was given on the toys pre-



Large bird house erected in park by members of the Crookston (Minn.) Homocraft Club

sented to one of the local orphanages, and entertainment was furnished by a magician. . . A total of 122 toys were made and given to the Salvation Army last year by the *Fairmont (W. Va.)* Homocraft Club. . . The *Billings (Mont.)* Homeworkshop Club recently saw a demonstration of oil testing at a refinery. . . The cutting of a drop-leaf table joint with a molding cutter was demonstrated to the Capital Homocraft Club, *Washington, D. C.*, at the home of Henry Robb, who specializes in reproductions of Colonial furniture. Edgar W. Parks has offered a prize for the member who obtains the greatest number of new members this year. . . Members of the *Orange (N. J.)* Homocraftmen Club have been mending furniture at the meetings.

"Safety in the Home Workshop" is the topic selected by the (Continued on page 99)





Members of the Bison Homeworkshop Guild, Buffalo, N. Y., with some toys they made

## NEWS OF GUILD CLUBS

(Continued from page 98)

Guild's Program Service Bureau for clubs to discuss at their May meetings. Information on the subject will be given in the monthly bulletin to secretaries.

Many difficult projects including tables, rocking chairs, a book binder, and a drafting board are being undertaken by members of the *Mexico (Mo.)* Homeworkshop Club. Howard Richards displayed a collection of veneer samples. Demonstrations, moving pictures, and the making of wooden plaques for announcing meetings are planned.

Prizes for woodwork, metalcraft, and miscellaneous projects will be awarded at the exhibition of the *Fall River (Mass.)* Homecraft Club in May. . . New officers of the *Toledo (Ohio)* Homecrafters are H. Cooper, president; G. McCleary, vice president; C. F. Hawkins, secretary; G. F. Travis, treasurer; M. F. Hesselbart, J. H. Storrer, and Julius Rabb, board of governors. . . Moving pictures on lumbering and woodworking were shown at the St. James Workshop Club, *Montreal, P. Q., Canada*. The *Brunswick (Me.)* Homeworkshop Club plans an exhibition for the fall to raise money for outfitting a clubroom. Toys will be made for distribution next Christmas. Earl Small demonstrated wood turning.

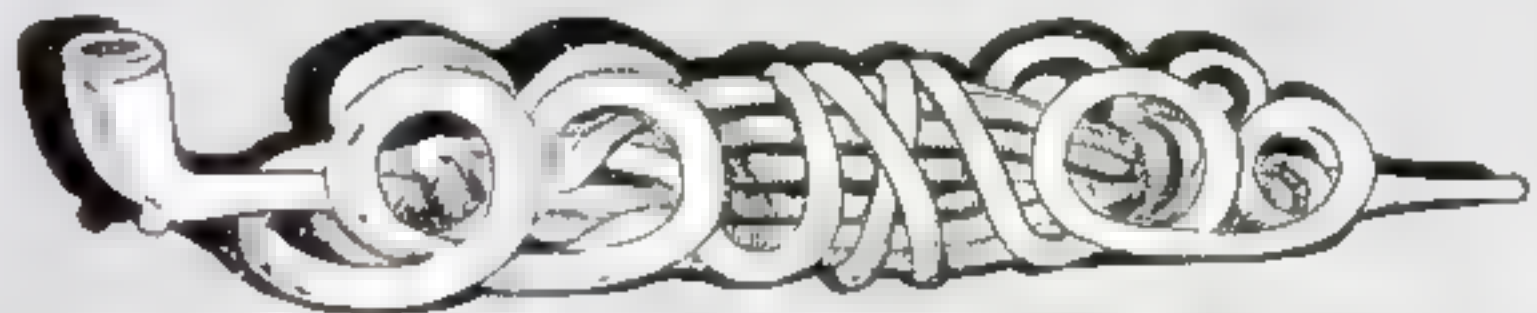
Plans for building a clubhouse and outfitting it with power tools have been started by the Twin Cities Homecraft Club of *Biddeford and Saco, Me.* A Christmas project will be started soon. Officers are Everett Whitten, president; Benjamin Simpson, vice president; Edwin Chadbourne, secretary; Richard Parker, treasurer.

One-quarter of the model railroad project of the Society of Model Engineers, *Ottawa, Ont., Canada*, has been completed, including passenger terminal, coach yards, turntable, and roundhouse facilities. When completed the layout will be 13 by 15 ft. . . The Lackawanna Homeworkshop Club of *Penticton, B. C.*, has selected Dick Forster's project to represent the club in the Guild contest. A membership drive is being conducted.

The Homecraft Guild of *Jamestown, N. Dak.*, has started a game board project for the use of Federal relief agencies in the recreational field, and will build bird houses for the local park board. . . James Theis acted as host to the Ship Craft and Model Engineering Guild of *Cincinnati, Ohio*, recently and displayed ship models, a model railroad, and a built-in cabinet. The club has also visited a mechanical engineering laboratory through the efforts of Elmer Schilling. . . New officers of the *Jacksonville, (Fla.)* Homeworkshop Club are A. P. Meredith, president; Ralph Richards, vice president; Dr. S. B. Schumacher, secretary-treasurer; J. Higdon Seals, W. L. Ivey, and H. L. Hodges, governors.



SEE, THE STEM IS CURVED AND INTERTWINED IN AN INTRICATE PATTERN. STRETCHED OUT STRAIGHT, IT WOULD MEASURE TWELVE AND A HALF FEET. ITS PURPOSE WAS TO COOL THE SMOKE AND SAVE THE SMOKER'S TONGUE FROM "BITE"

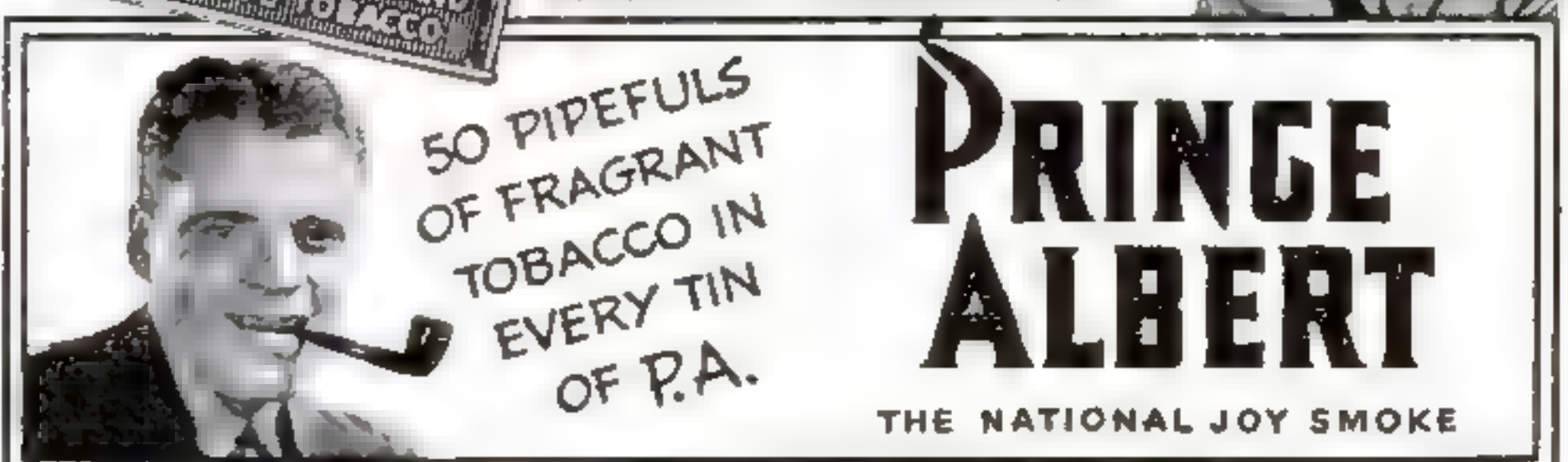


**PRINCE ALBERT  
MONEY-BACK  
GUARANTEE!**

**PRINCE ALBERT  
IS SWELL  
MAKIN'S TOO!**

Smoke 20 fragrant pipefuls of Prince Albert. If you don't find it the mellowest, tastiest pipe tobacco you ever smoked, return the pocket tin with the rest of the tobacco in it to us at any time within a month from this date, and we will refund full purchase price, plus postage. (Signed) R. J. Reynolds Tobacco Company, Winston-Salem, North Carolina.

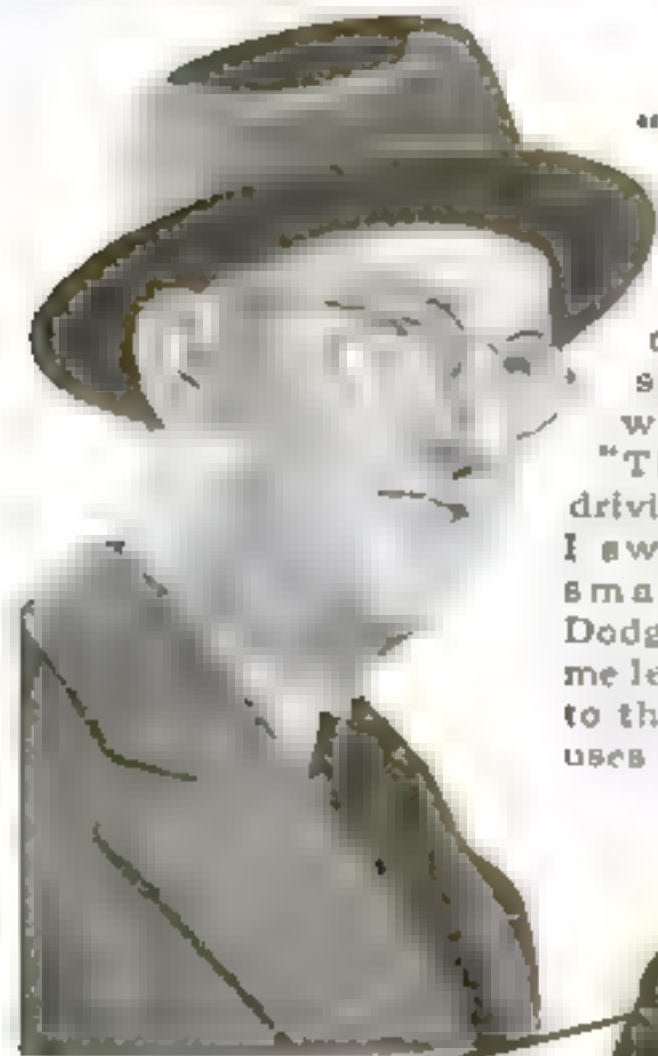
Copyright 1937 R. J. Reynolds & Company





# THOUSANDS SWITCH TO DODGE!

*Here Are a Few of Them!*



"The car I drive must be easy on gas and easy on my pocketbook in other ways," says I. J. Boulware, Chicago. "That's why I'm driving Dodge—and I switched from a smaller car! My Dodge hasn't given me less than 19 miles to the gallon and it uses 20% less oil!"

"Since we switched to Dodge we're getting 8 miles more to the gallon than we got from our old, smaller car. We'll easily save \$70 a year." —Mrs. G. Norman Townley, Plainfield, N. J.



"You can't beat Dodge for economy," says Jimmie Huskisson, Valley Park, Mo. "I'm getting 21 miles to the gallon of gas which is 7 miles more than my old car gave me. At the rate we drive it, that will mean close to \$100 saved by the time I have had this new Dodge a year."



## DODGE

DELIVERS NOW FOR JUST A FEW DOLLARS MORE THAN THE LOWEST-PRICED CARS!

Easy terms gladly arranged to fit your budget, at low cost, through Commercial Credit Company.

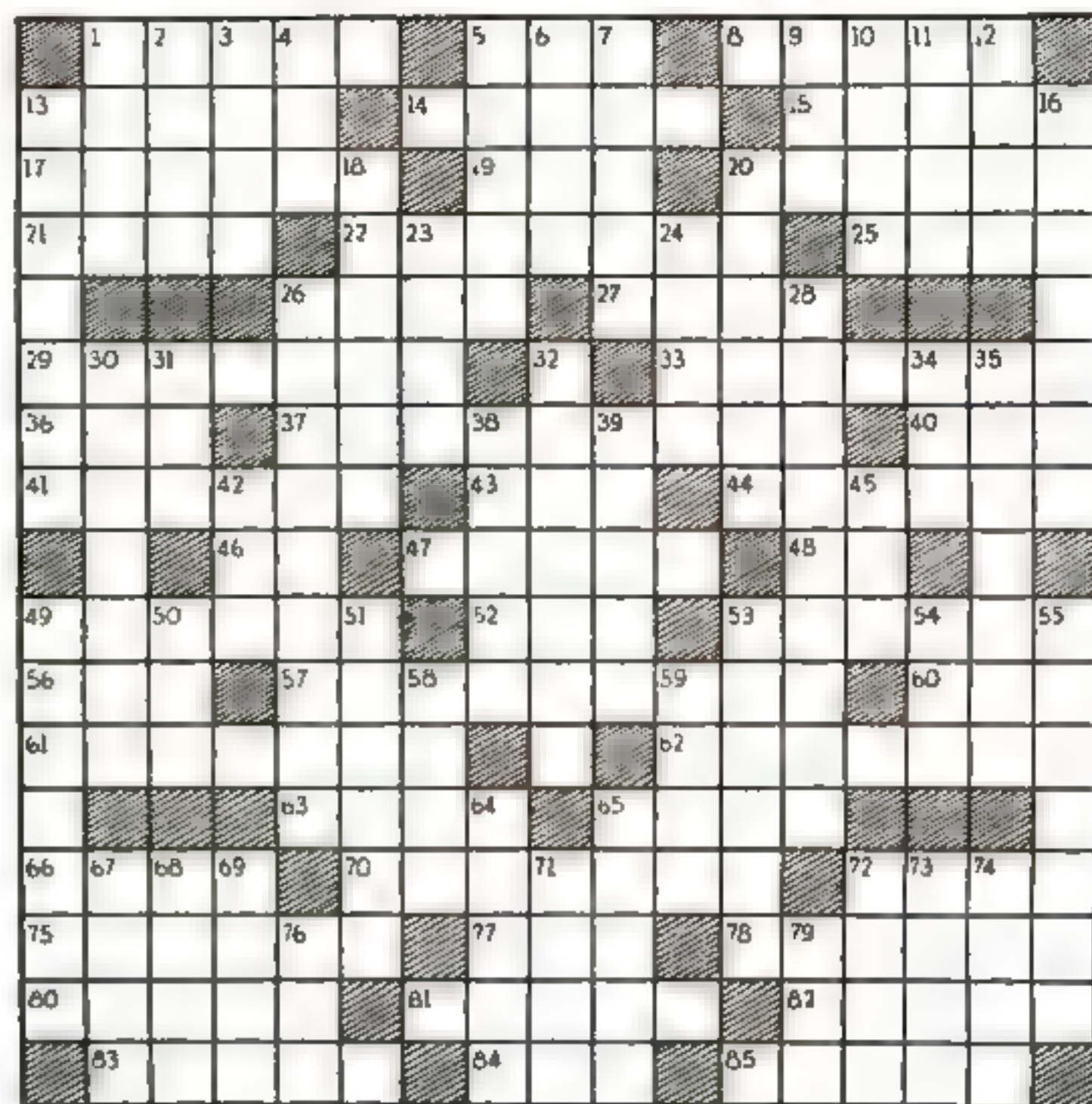
## Can You Solve the Guild's CROSSWORD PUZZLE?

HERE is an unusual crossword puzzle—none you'll have lots of fun solving. Many shop terms have been incorporated because it was prepared especially as a program

feature for the use of clubs affiliated with the National Homeworkshop Guild. Arthur L. Smith devised it with several intriguing twists. The solution appears on page 107.

### ACROSS

1. A unit of weight for jewels.
5. A small piece of tripod furniture with a tripod upper section for resting dishes to warm before the fireplace.
8. A wand for beating time.
13. A gradual and uniform decrease in size, as of a shaft.
14. A machine for making butter.
15. To predict.
17. Having a handle or handle-shaped part.
19. The area of a ten-meter square.
20. A unit for measuring electric current strength.
21. A contrivance in a loom.
22. Smoothed off, as with sandpaper.
25. To transfer property for a price.
26. The winding part of a capstan or hoisting machine.
27. A deduction from the weight of goods.
29. The name of a printer placed on a piece of printing.
33. Pertaining to the arid division of the austral zone.
36. Letters indicating a screw-thread standard.
37. Coincident in direction with the directions of stress or strain.
40. A single unit.
41. Having hinges.
43. The brightest star in various constellations.



44. Melted, said of frozen liquids.
46. Half the square of a type body.
47. Navigators Islands.
48. The chemical symbol for arsenic.
49. An internal force which resists change in the shape or size of a body.
52. The border of a circular object.
53. The tone a half step above C.
56. A garden tool.
57. Capable of being ionized.
60. (Geog.) A long

- narrow inlet.
61. To judge favorably.
62. A rower.
63. Points of a pen.
65. Trees of the genus Ulmus.
66. To produce designs on metal or glass by the eating action of acids.
70. An indenture or figure resembling a shell.
72. An egg-shaped figure.
75. To heat again.
77. To scour or burnish.

78. To mark off wood or metal to be cut.
80. A contrivance by which a bird or other animal may be entangled.
81. A whitish powder used as a developer in photography.
82. Audibly.
83. The impurities which are skimmed off molten metals.
84. Letters on the emblem of the Woodmen of the World.
85. To obtain metal from ore.

### DOWN

1. A flexible plant product for seats.
2. The altar end of a church, or a recess.
3. To interpret characters or drawings, as those of a blueprint.
4. Skill acquired by experience.
5. A small decorative object worn on the person.
6. A draft or motion of the air caused by electric repulsion.
7. A rest, as that of the lathe, shaped like a T.
9. An old Dutch and German measure of about 40 gallons.
10. The rams or falling weights of pile drivers.
11. A molding having in section a reverse curve.
12. To knurl (a variant spelling).

13. To lose luster, as that of polished metal.
16. Having the inner surface covered again.
18. Merited by labor.
20. Dexterous in the use of the hands.
23. A joint where two ends come squarely together without scarfing.
24. The direction of sunrise.
26. A definite measurement shown on a drawing.
28. Those who ornament by embossing, inlaying, or engraving.
30. The platform about the mainmast in a square-rigged vessel.
31. A writing implement.
32. To divide a stream or jet of any liquid into a fine spray.
34. To propel with oars.

35. Deficiency of nervous energy.
38. Mites.
39. An agreeable odor, as that of coffee.
42. A command to oxen to turn to the off side.
45. A light-colored, coarse-grained wood used for hammer handles.
49. Machines for cutting moldings.
50. A fabric of silk or wool having a transversely corded surface.
51. A Russian governing body elected by shops or organizations.
53. Tools for holding portions of work together.
54. The rod of a steel-yard.
55. Having a raised or sunken portion surrounded by a frame, especially in some types of woodwork.

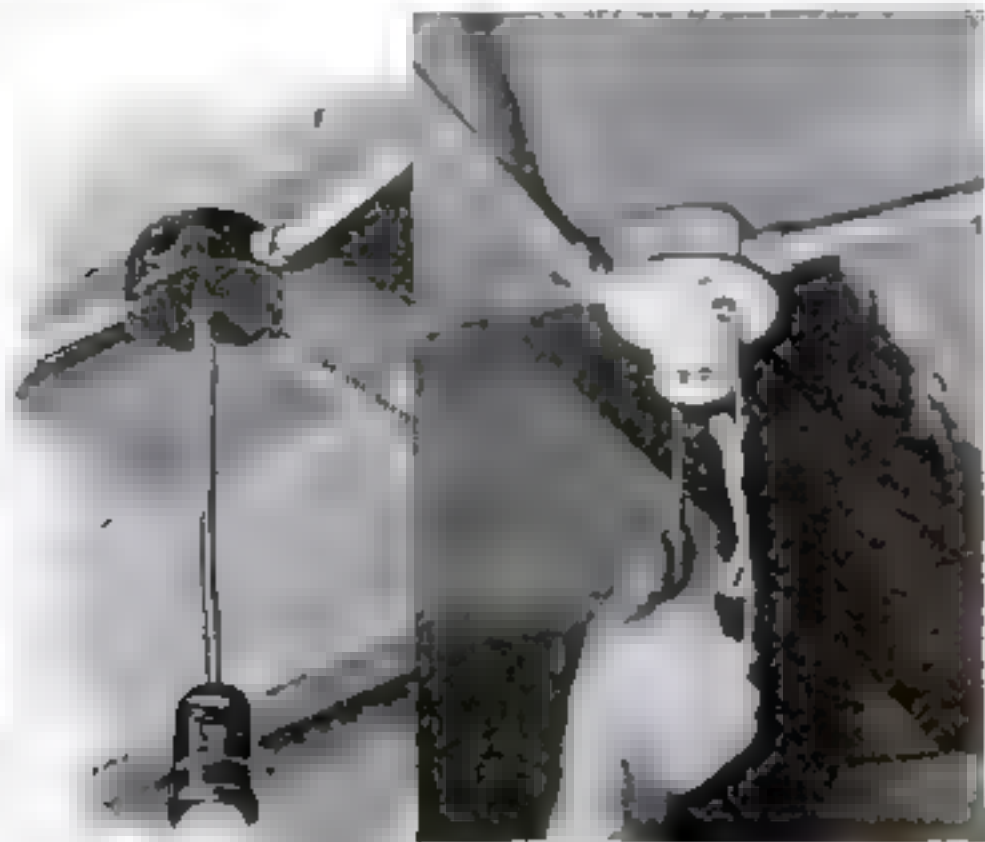
58. The pointed or narrowed ends of things.
59. A kind of large single-edged knife.
64. A helix wound around a cylinder.
65. A fitting joining two pipes.
67. To attend as an assistant.
68. To burn to charcoal.
69. A valorous person.
71. Automobile.
72. A narrow fillet, especially at top of shaft. (Arch.)
73. A large rope sometimes used in weighing anchor.
74. To cause to meet end on, as a timber against a post.
76. Bronze or copper. (Rom. Antiq.)
79. A plate or cylinder which transmits variable reciprocal motion to a piece of mechanism by means of a follower.



## WATCH CELLAR WIRING

(Continued from page 85)

new base outlets could be used in the rooms above. To do this, cut in 3-in. junction boxes on the run as required, using box connectors and extending the tubing from the junction boxes to the points where the plugs are to be. In the case of new cellar lights, install the new porcelain pull-box fixtures as in one of



Installing a modern porcelain-box type of cellar light, which replaces the old style at left

the illustrations. In this view the entrance to the left side of the box is made with an elbow connector. This is only one of the many fittings that adapt tubing to almost any condition. Of course, the necessary wires are pulled in with the aid of a fish wire before these fixtures are installed.

Several years ago we used a cord cover, a short piece of cord, and a key socket as a fixture, but the porcelain-box type is much superior and is largely replacing the old cord pendants. Another point to note is that the BX cable is no longer allowed by the Code to run across the bottoms of the timbers. To cross open timbers or studding, it is now required that running boards or guard strips be provided for protection. The former is usually chosen, and such work is illustrated. Ordinary strapping or so-called "furring strips" of  $\frac{3}{8}$ -in. wood, 2 in. wide, are first nailed to the timbers. To this the cable is attached with staples or small pipe straps and nails. This provides a flat surface for protection.

The illustration heading this article is that of a modern two-family meter board, which



Strips are nailed to beams to support the BX

was photographed to show how all-metal construction offers maximum protection. The new type socket meters are installed about as easily as we plug a cord in a base outlet. Above each meter is a load switch that will cut off the current to each apartment. Coupled to each switch is a cut-out cabinet housing the fuses. The circuits, which run in BX cable, can be seen, there being two circuits to each apartment. In making an additional circuit, as was done in the bathroom wiring described, we would simply remove one of the fuse cabinets, if it were too small to contain another cut-out block, and substitute a larger box.

# DID YOUR BATTERY COME FROM A GOOD PIG?



"Did you ever hear of a pig-dust collector?"

"That's what I am. They say 'pigs is pigs' but that's not true when it comes to pig lead for storage batteries. Just a shade of impurity may upset the chemical balance inside a battery and shorten its life.

"So here at Willard we saw apart sample pigs of lead from every shipment—collect the lead sawdust and analyze it in laboratories *before* the shipment is unloaded. Result: none but the purest of materials get into a Willard Battery."

\* \* \* \* \*

This is typical of the 74 tests and inspections which control every operation in the building of Willard Batteries. Because only the best of materials and the finest of skill go into them, *Willards last longer—crank faster—don't let you down.* And owners' records prove that Willards Cost Less To Own.

You'll find today's prices for a Willard much lower than you might expect.

WILLARD STORAGE BATTERY CO. • Cleveland • Los Angeles • Toronto, Canada

# Willards

**COST LESS TO OWN!**

**Because they last longer... crank faster... don't let you down**





## Happy Shaves Are Here Again

*when you use the blade  
that was made for your razor*

**H**ERE'S a suggestion for men who find shaving a task to be dreaded. Switch back to using Gillette Blades in your Gillette Razor. Then notice how smoothly your razor removes every trace of stubble.

You'll agree that an "All-Gillette" shave is the last word in shaving comfort. For the Gillette Razor and the Gillette Blade are made for each other. Rigidly matched in design and manufacture, they function together in perfect harmony.

Teamwork of razor and blade—that's the secret of clean, comfortable shaves!

### Light Waves Measure Sharpness

So great is the precision required in manufacturing Gillette Blades that special equipment is needed. For example, a truly amazing finishing process alternately hones and strops each blade until its shaving edges are so keen that only light waves can measure their sharpness.

If you have strayed away from using Gillette Blades in your Gillette Razor, get back into the comfort swing right away. Buy a package of Gillette Blades today; enjoy a real shave tomorrow.

*Reputable merchants never offer substitutes for Gillette Blades. Always ask for them by name!*

*Smile and sing with Milton Berle and other stars on Gillette's "Original Community Sing" radio program—CBS Network—Coast to Coast—Sunday nights—10 P. M., E. S. T.*



## Gillette Blades

*Precision-made for the Gillette Razor*

## MAKING THE MOST OF A TRAILER TRIP

*(Continued from page 49)*

about prices and equipment. Trailer travelers, we found, are friendly folk, glad to help a fellow enthusiast.

One man showed me how to loop the extension cord around the overhead wire before attaching the plug, thus taking the strain off the connection and keeping the lights from flickering on windy nights. Another explained how the caster wheel should be turned sideways on a board when the trailer is detached so the front can be swung to one side or the other when the car is being backed to connect the hitch later on. A third showed us how a length of hose, which can be attached to the faucet, saves time in filling the water tank. A fourth demonstrated how a pair of auto jacks under the forward corners of the trailer steadies it and takes the strain off the caster wheel.

**WE WERE** beginning to feel chagrined at our ignorance, until we discovered that we were not the only greenhorns on the road. On our second morning in camp, we were awakened by a shout and the slithering of wires. Our next-door neighbor had started to drive away with his light cord still attached to the overhead connection!

Noontime found the Washington camp almost deserted. It was weeks before we grew used to these disappearing cities on wheels. At dusk, a trailer camp may be filled with rows of varicolored houses. The smell of frying meat pervades the air. Cheerful smoke pours from many chimneys. By ten o'clock the next morning, only the stragglers remain. The city has rolled away.

We rolled away, too, the next day; past Mount Vernon and the reconstruction of Washington's mill, through Richmond, Va., and on to a hillside auto camp near Petersburg. From then on, we drifted south by easy stages. Our days were our own. We usually took to the road a little after eight, as soon as the breakfast dishes were washed. Sometimes, we pulled up under a tree or swung into a vacant field for lunch. At other times, we bought sandwiches and ate as we drove.

One thing we learned. Don't park for lunch too close to the highway. The first time we did, I was lighting the gasoline stove when the trailer rocked and trembled as though caught in an earthquake. The backwash of air from a speeding automobile had struck us. Every time a car rushed past, the trailer shook and vibrated. A few feet farther from the concrete took us beyond the reach of the disturbed air.

Every day, as we continued our vagabond journey south through the Carolinas, Georgia, and on into Florida, we saw new sights, encountered new experiences.

**WE PASSED** filling stations with Virginia hams for sale; a dairy farm with its barn labeled "Milking Parlor," southern swamps whose trees dripped with Spanish moss; chain gangs at work on Georgia roads. We sampled sugar cane and were surprised to find the taste of its juice resembled that of fresh milk. On the road from St. Augustine to Palatka, Fla., we met a traveling circus with a caravan of nearly forty trailers. One of the trapeze performers told me they had traveled 15,000 miles in thirty weeks.

Sometimes we selected our day's destination ahead. At other times, we drove until dusk and then stopped at the most likely looking auto camp, or even in a farmer's yard. Once, we firmly declined an invitation to spend the night in a farmyard in which there was a wire cage full of live rattlesnakes!

The biggest scare of the trip occurred in the trailer camp at Gainesville, Fla. Some-

time after midnight, we sat up in bed with a start. We had been awakened by what sounded like a series of sharp pistol shots. It occurred again—crack, boom!—and something hard struck the trailer. Our first thought was that somebody was shooting at us. Then, we discovered what was happening. We had parked under a great live-oak tree. Acorns, loosened by the wind, were falling on the roof!

**BEFORE** we reached Sarasota, we had stopped at many camps—big camps, little camps, city camps, country camps. At one, on the outskirts of St. Augustine, Fla., half a dozen of us chipped in and had an oyster supper together. Some trailer travelers put small cards, with their names and home cities printed on them, in the windows of their wheeled houses. Others have their trailers named like motor boats. One had "The Wanderer" printed on the front; another, "Our Camp Home;" a third, "Lazy-bones;" a fourth, "The Gasoline Wigwam."

At many camps you receive just enough electricity to run your trailer lights and a radio. Some have one-ampere fuses. If an occupant of a trailer attaches a toaster or an iron, the fuse blows out. A new one will cost him a quarter or more, and if he blows out three fuses he is asked to leave camp. A number of parks require that waste water from the sink and ice box be caught instead of being allowed to run into the ground. So it is well to take along a small pail for the purpose.

One of the most attractive camps we visited was at Bartow, Fla., where trailers park under wide-spreading trees. Oftentimes, space in this camp is contracted for six or eight months ahead, the manager told me. The same trailers come back to the same lots year after year. In one instance, an elderly pair are driven down by a niece who uncouples the car and drives back to the Middle West again, returning the following spring to tow the trailer home.

Before we reached Sarasota, we drove along the Gulf coast, through the sponge-fishing center at Tarpon Springs, and on into Tampa. It was near here that those intrepid adventurers in Jules Verne's "From the Earth to the Moon" began their imaginary voyage into space. Not even the fertile brain of the great French romancer, however, had visioned this vast caravan of which we were a part—a quarter of a million houses rolling about the country on wheels and often settling down at dusk 300 miles from their location at dawn!

It was late on Friday afternoon when we turned down the road leading into the vast level expanse which forms the Sarasota Trailer Camp. Operated by the city, it will accommodate more than 1,400 trailers at one time. It is a Mecca for motor nomads from all over the country. Some stay only a few weeks; some from fall until spring.

**WE PULLED** up at the office and filled in a long blank. Did we have any cats, any dogs, any children, any firearms? Where were we from? What kind of current did we want? It developed that the Sarasota camp has a "super-power street" running down the middle. Here the weekly rate is more, but you obtain a heavier flow of electricity and can use irons, vacuum sweepers, toasters, and other conveniences.

As we had no sweepers or irons, we chose an ordinary street and were assigned to Lot 25, Street 12. An electrician rode on the running board of the car to show us the way and hook up the light cord. He told us that at the height of the season the year before, 500 trailers had *(Continued on page 103)*



## HOW TO GET THE MOST OUT OF A TRAILER TRIP

(Continued from page 102)

come in during a single day. Only fifteen had come in on the day we arrived.

When the electrician left, we looked around. Amid long lines of palms, trailers of every size and shape and color were drawn up facing the roads, with automobiles parked close beside them. There were sleek, streamline products of the factory and sturdy, ingenious creations of owner-mechanics. Some had barometers hanging from the outside and a few carried bicycles or outboard motors in brackets. Many had brightly colored tents to protect their cars from sun and rain.

AS WE walked up the street to the "village store", a little later on, we observed license tags from half the states in the Union. The trailer behind us had come all the way from California. In contrast, the first man I met in the washroom the next morning, when I went to shave, came from Deer Park, N.Y., only eighteen miles from my home!

In Sarasota, the newspapers list new trailer arrivals just as papers in seaport cities list distinguished passengers who arrive and depart on ocean liners. We were hardly settled down the first night before the newspaper delivery boy rapped at the door. When the camp population is at its peak, he said, he delivers as many as 400 papers a day. Later, the ice man called, and during succeeding days we found we could obtain fresh vegetables, milk, and even laundry service at the camp. For those who wish to do their own washing, ample laundry facilities are supplied, including a continuous flow of hot water and free electric ironing.

We found the trailer town was largely a city of leisure. An hour a day at most took care of housekeeping. The rest of the time, the occupants of the wheeled houses could read, play games, go fishing, or just loaf in the sunshine. Checkers, chess, shuffleboard, horseshoes, and a host of other games are available in or near the recreation hall. Programs for the day are announced at intervals through a loudspeaker system that extends throughout the camp. There are dances on Saturday nights, church services on Sundays, and plays, masquerades, wiener roasts during the week.

Our next-door neighbor, Jack Taylor, disappeared each morning and returned at evening with an amazing assortment of sharks and rays and tropical fish he had hooked during the day. He had the interior of his trailer fixed up like a sportsman's den, with stuffed fish and mounted heads. He and his wife have been trailer nomads ever since they were married. They have been in every section of the country, have lived in two trailers, and say they wouldn't enjoy any other life.

LIKE any other large city, the Sarasota camp has a post office, a telegraph office, garbage collection, sewage disposal, and similar conveniences. Policemen patrol the grounds on regular beats. There is even a fire department with a red fire engine ready for emergencies!

It was with real regret that we loaded up one Wednesday morning and headed away from this city of mobile homes. However, much of interest in our trip remained ahead of us—the Everglades, the Tamiami Trail, Lake Okeechobee, and a host of fresh experiences.

We were starting the loop that would carry us home and gave us additional knowledge of trailer life with its unique possibilities and problems. Our race along the flat sands of Daytona Beach, our adventure in the narrow streets of St. Augustine, and, finally, our triumphal parade up traffic-packed Broadway in New York City—all these still lay before us.

# Half & Half Makes ONE Swell Smoke!



Springtime brings new hope, new cheer. So does Half & Half. Cool as a letter that looks like a bill. Smooth as discovering a check is enclosed. Fragrant, friendly, full-bodied tobacco that won't bite the tongue—in a tin that won't bite the fingers. Made by our exclusive modern process including patent No. 1,770,920. Cool and smooth. Smells good. Makes your pipe welcome anywhere. Tastes good. Your password to pleasure!

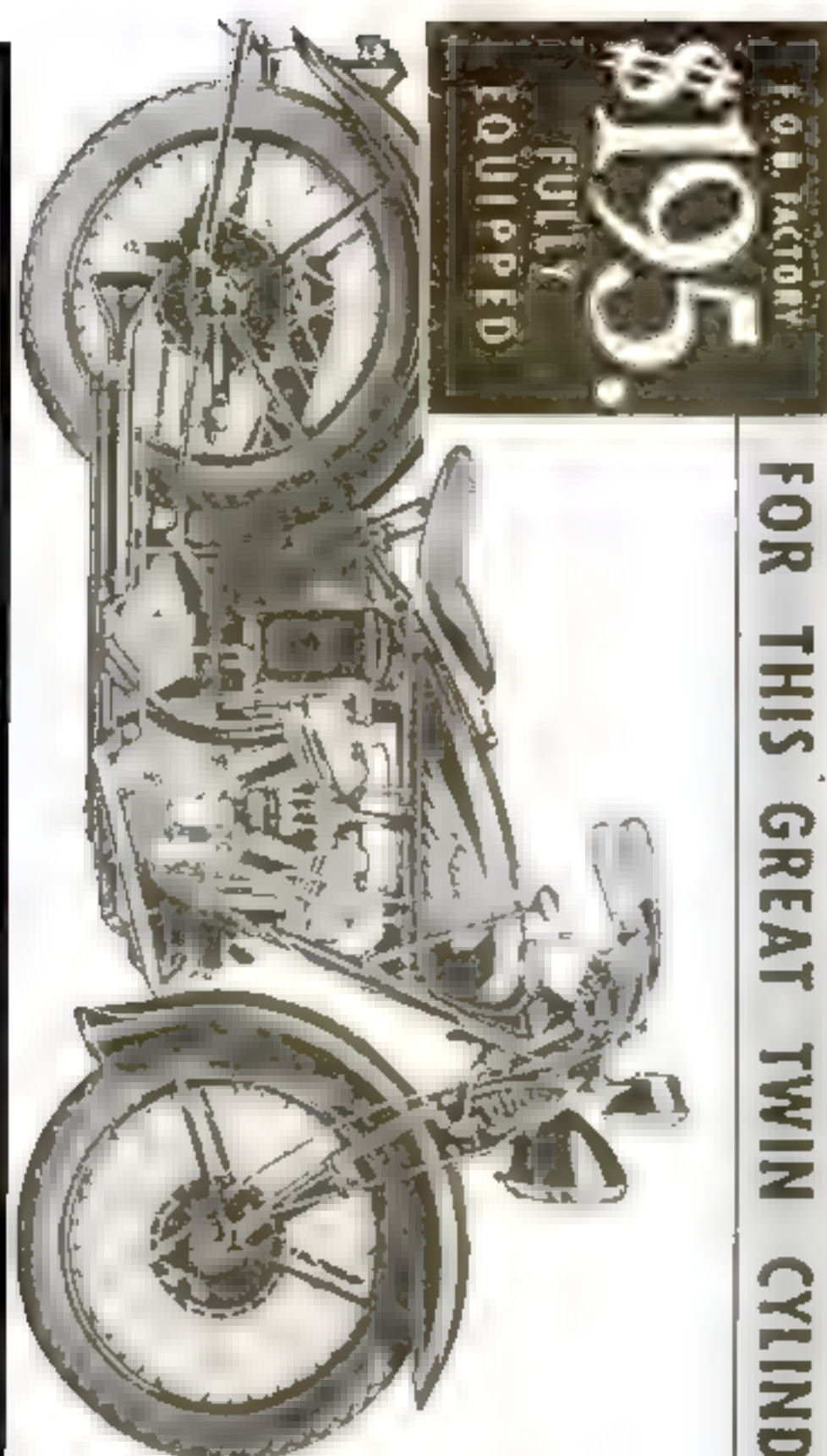
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## HALF *AND* HALF

### The Safe Pipe-Tobacco

FOR PIPE OR CIGARETTE





100 FACTORY  
FULLY  
EQUIPPED  
\$195.

FOR THIS GREAT TWIN CYLINDER

YOU CAN'T BEAT IT!

Indian JUNIOR Scout

FREE! INDIAN PIN AND RIDER'S HELMET

More motorcycle per dollar than ever before! A real, powerful, twin-cylinder motorcycle with 70 mile-to-the-gallon economy—yet costs you less than \$200 to own.

If a bigger machine interests you—Ed Kretz on an INDIAN SPORT SCOUT just won the 200-Mile National Championship Road Race at Daytona Beach, Florida, in record time.

You can see both of these machines at any Indian Dealer's—they can be bought on easy terms. And when you order you get a FREE RIDER'S HELMET and WINGED PIN!

MAIL COUPON TODAY!

INDIAN MOTORCYCLE CO., Springfield, Mass.

Please send me at once, and without obligation, the new Indian Scout Junior, and without obligation, the new Indian Sport Scout, and without obligation, the new Indian Scout Junior, and without obligation, the new Indian Sport Scout.

Name \_\_\_\_\_

Address \_\_\_\_\_

Please be sure to check your age group:

☐ 16-19 years ☐ 20-29 years ☐ 30-39 years ☐ 40-49 years ☐ 50-59 years ☐ 60-69 years ☐ 70-79 years ☐ 80-89 years ☐ 90-99 years

## NEW CITIES IN THE ARCTIC

(Continued from page 28)

vessels steams along the narrow lane smashed through the floes for them—making a picturesque sight from the air as white plumes of steam show them exchanging signals, and as they alter their courses to follow the ice breaker like a brood of chicks behind a mother hen.

Only recently has this come about. When the Russian ice breaker *Siberiakov* startled the world in 1932 by battering its way through ice packs from Archangel to the Pacific in a single season, it had accomplished a feat attempted for 400 years without success. Ships of the Norwegian explorer, Amundsen, the Swedish explorer, Nordenskjöld, and the Russian explorer, Vilkitsky—the only ones that ever made the complete passage before—were all forced to spend from one to two winters locked in the ice along the way. The *Siberiakov* took two months.

IN 1934, the Russian ice breaker *Litke* duplicated the *Siberiakov's* voyage in the opposite direction, successfully completing the east-west arctic passage. The next year marked the turning point from experimental to commercial voyages. Two Russian cargo ships, built almost exactly like standard commercial steamers, broke through from Murmansk to the Pacific. Another pair of freighters traversed the return route from Vladivostok to Murmansk. One of them went on to London, fulfilling the vision of sixteenth-century navigators of England and Holland—a northern trade route from Asia to Europe!

Last year, no less than fourteen merchant ships sailed all the way across the Arctic Ocean between the Atlantic and Pacific. More than 100 vessels completed shorter voyages in the polar sea, bringing to 276,000 tons the yearly total of freight carried over an "impossible" route. No longer are the voyages spoken of as "expeditions"; they are "operations." Dollars and cents tell the most convincing story of the Northern Sea Route's conquest. By way of the Trans-Siberian Railroad and a river boat, according to the American Russian Institute, it will cost you eighty-six dollars to ship a ton of freight from Moscow to Yakutsk. By way of the Northern Sea Route, the rate will be only fifty dollars—and this price includes special charges for radio, airplane, as well as ice-breaker services.

Triumphs of engineering are the ice breakers which have made this possible, and which Soviet technicians have developed to their highest efficiency. The long, overhanging bow of a standard Russian ice breaker overrides the ice, breaking off huge chunks by the sheer weight of the vessel when forward tanks are pumped full of water. This method works best against level, smooth ice fields. A newer type of ice breaker, represented by the *Litke*, has proved its worth against piled-up pack ice. Built like an ice pick, it charges headlong at masses of ice ten to twelve feet thick. Its sharp, heavily reinforced prow splinters the ice in exactly the same fashion as the household utensil.

POWERFUL new vessels under construction will augment the Russian ice-breaker fleet, already the largest of any nation. Special merchant ships for arctic service are also planned. Their plates will be joined by electric welding, and enormous pressure from ice packs can do no more than dent the hulls, averting the danger of springing leaks that might send the ships to the bottom.

Inland transportation, too, has been made over by the new Soviet regime. Until recently, the vast river system of northern Siberia, providing waterways navigable less than four months a year, was the only way

of reaching the interior. In a straight line, for example, only seventy miles separates the Yenisei River port of Dudinka from Norilsk, where rich deposits of nickel have been discovered. Traveling from one to the other, however, actually meant a 1,600-mile journey by way of two rivers and the Arctic Ocean! Now the northernmost railroad in the world is bringing the nickel across intervening mountains to Dudinka, for ocean-going steamships to carry to market.

SIDE by side with reindeer-drawn sleighs may now be seen such strangely contrasting modern vehicles as automobiles with skis and tractor treads, and "aero-sleds"—a novel creation of Soviet engineers for arctic use. Driven by air propellers, these machines travel over the snow at speeds up to thirty miles an hour. Their forty-two-horsepower motors do not require the highest-test gasoline, burning a mixture of gasoline and kerosene known as "ligroin." A machine shop at Gorkii has begun turning them out in mass production, and soon an arctic settler with a flair for joy-riding will be able to buy one for about \$2,400. Amphibian aero-sleds that will travel on ice, snow, or water also have been developed.

On long-distance inland trips through the Soviet arctic, you go by air. Swift seaplanes course up and down the great rivers on new routes leading to the Northern Sea Route ports, and even to isolated Wrangell Island, where polar observers formerly spent years on end out of touch with the mainland. By the end of this year about 18,000 miles of arctic airway will be in operation, and 27,500 hours of flight are planned, as against only 484 hours in 1933.

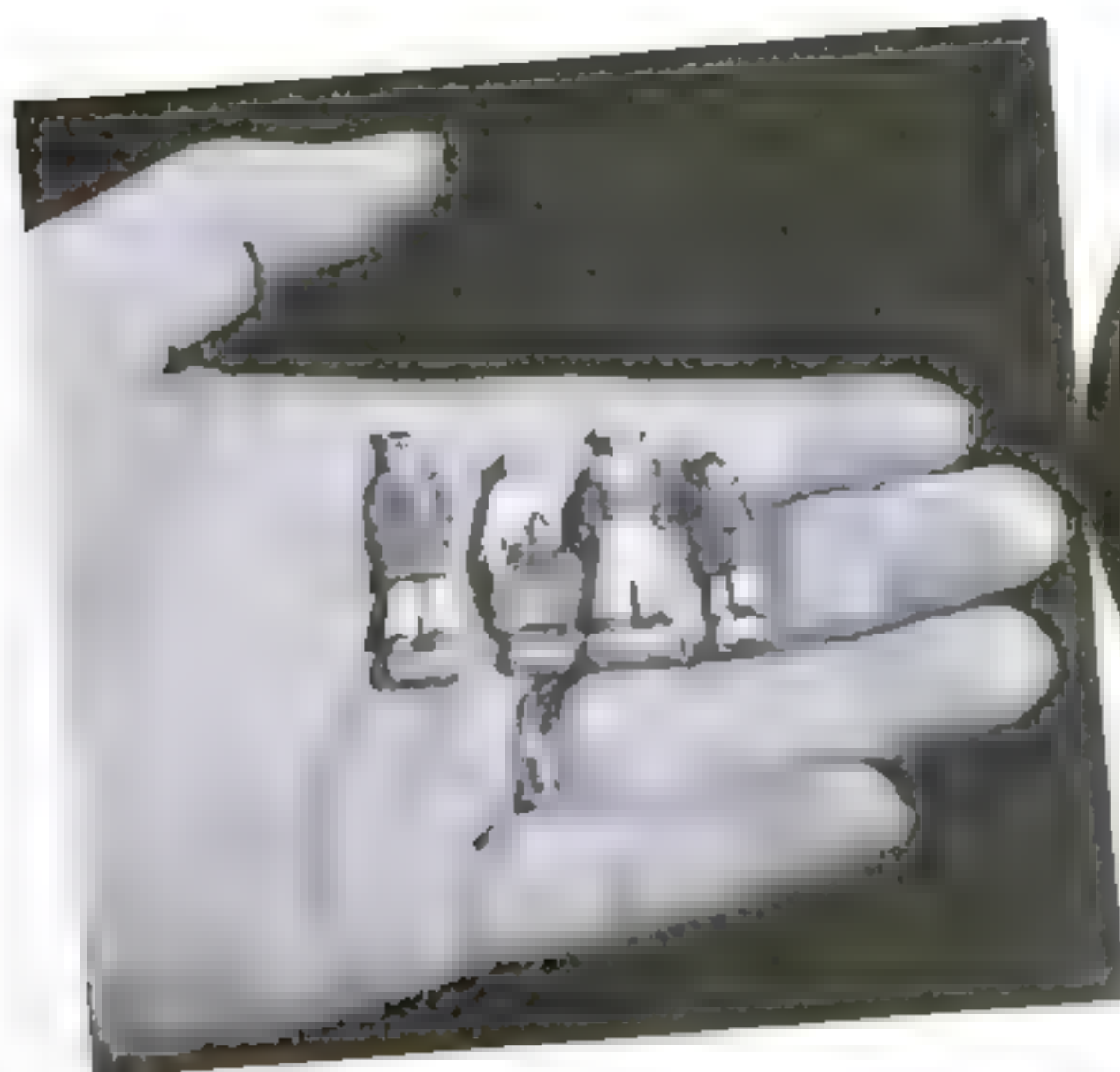
Meanwhile, the Soviet is pushing its explorations still farther north. A recent objective of the ice breaker *Sadko* was to follow out a mysterious open-water channel, at some points only 600 feet or so wide, apparently cut through the ice by an extension of the warm Gulf Stream. Instead of leading in a direction that might benefit ships of the Northern Sea Route, as scientists had hoped, the unexplored trail took them toward the north pole. Cruising freely in open water, flanked by barriers of impassable ice, the *Sadko* one day reached the northernmost point ever attained by a vessel under control of its pilot—a latitude of eighty-two and a fraction degrees, less than 630 miles from the pole itself!

ON THE same cruise, the *Sadko* discovered a whole crop of new islands in the "white spot" on the map between Franz Josef Land and Severnaya Zemlya—an unexplored area as large as Massachusetts, Connecticut, and Rhode Island combined. One oval spot of land twenty-eight miles long and eleven miles wide, christened Ushakov Island, offers special interest because of its strategic location as a possible air base for the U.S.-to-Russia air line.

Now, crack air pilots of the Soviet Union have proposed a breath-taking scheme—no less than parachuting to the north pole! From planes flying over it, their plan would be to land an exploring party completely equipped with provisions, scientific apparatus, radio transmitters, and even sledges and dog teams, just as troops and guns have been landed by 'chute in recent Soviet military experiments. After having obtained invaluable weather and scientific data, the explorers would prepare a landing field for aviators to pick them up again. Impracticable as the scheme might at first appear, it seems scarcely more fantastic than the wonders that Soviet pioneers of the arctic already have accomplished.



# Miniature Figures Easily Whittled with a Penknife



Cutting a Scottie and, right, how figures are blocked out

Four pocketknife miniatures, the largest 1 1/4 in. tall

**Y**OU'VE whittled Skipper Sam'l (P.S.M., July '35, p.63), Mère Marthe (Dec. '35, p.68), Gaspard (Dec. '36, p.68), and the six little Scotties (Feb. '36, p.63) as mantel decorations—now try making them in miniature size for curios, ornaments on paper knives, boxes, and book ends, or as the crew for your ship models. Such tiny figures (the larger sea captain in the photo is only 1 1/4 in. tall) do not require much detailed cutting. Just block them out carefully, and painting will do the rest.

Any small pieces of soft white pine or basswood will serve. I used thin strips about 3/8 by 7/8 by 4 in. The only trick is to lay out

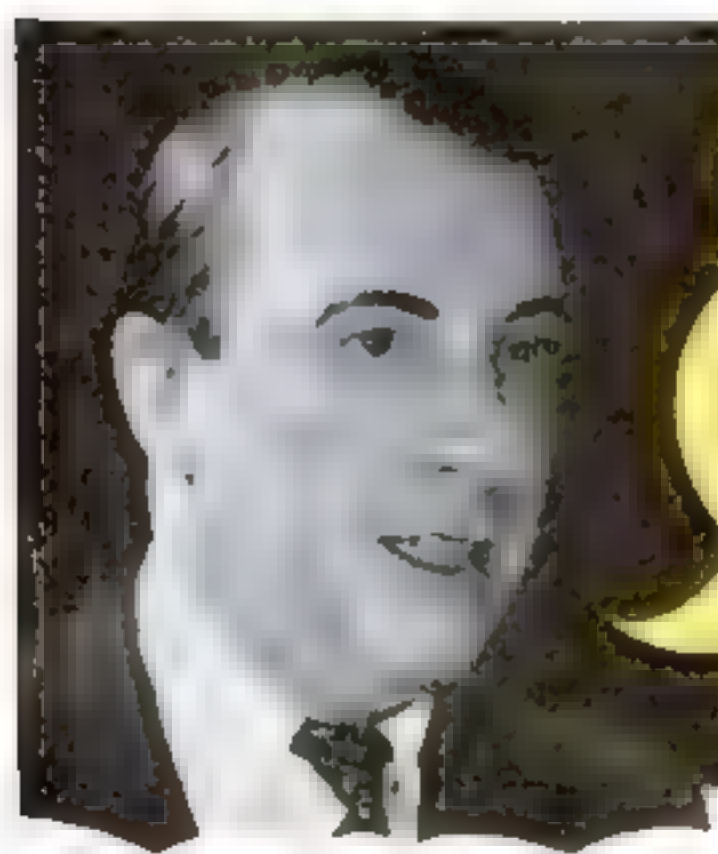
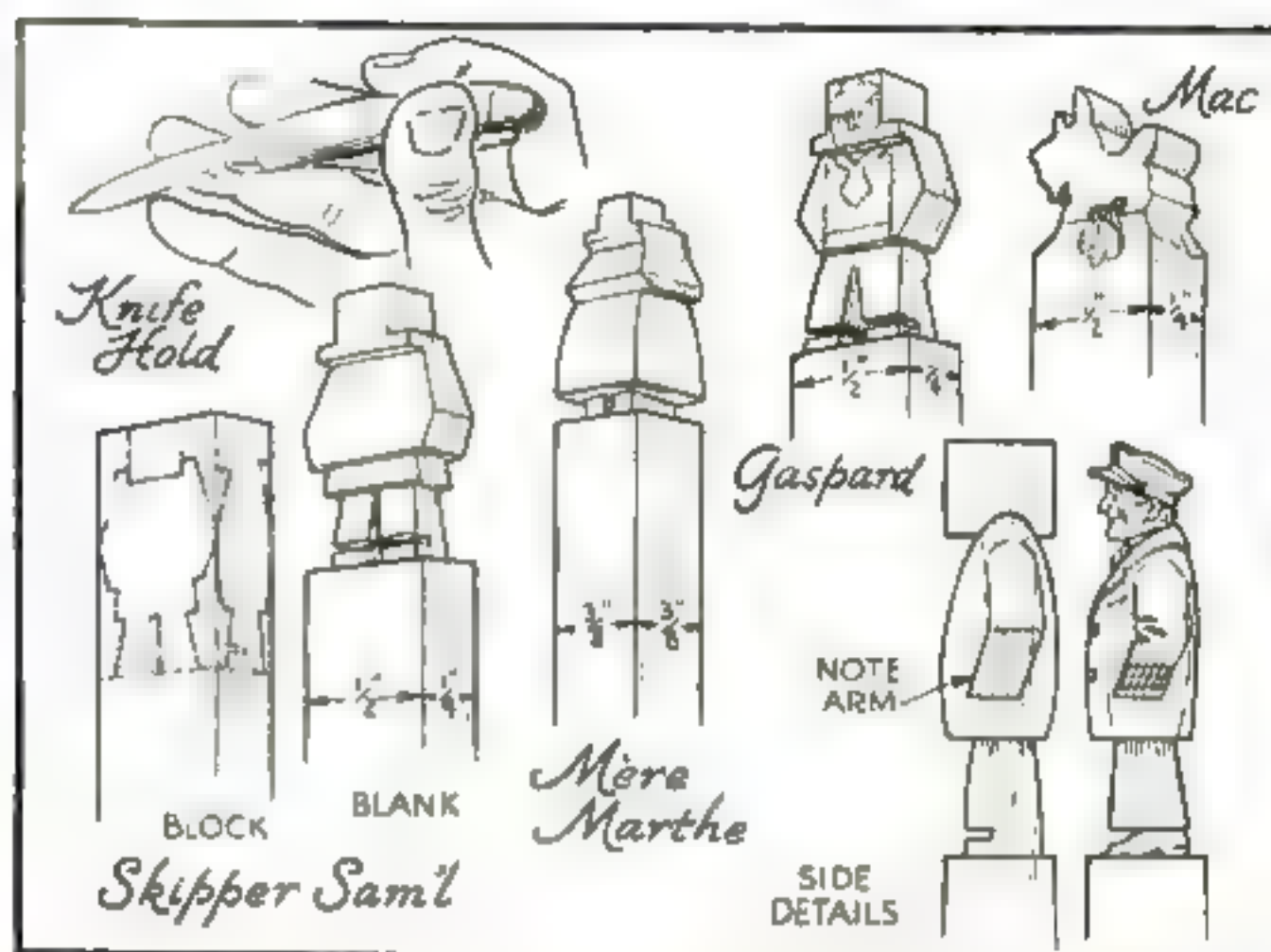
the blank at the end of the stick and carve it while using the rest of the stick as a convenient grip.

It is important to keep your knife blade sharp. To obtain accurate cuts and avoid overcutting or too great cutting pressure, it may help to hold the knife as sketched, using the tip of your little finger as a guide against the blank. It may also be easier, particularly in face details, to hold

the blade near the tip, like a penholder. In shaping many parts you must use the tip of the blade almost entirely. For cuts at the base and general shaping, the center of the blade will work satisfactorily.

I normally make Scotties as shown in the photo, with the grain running from nose to tail, but it may be easier for you to make them as shown in the sketch, with the grain running vertically through the body. The latter minimizes the chance that the ears, eyebrows, and tail may break off, but be very careful in separating the legs.

A somewhat opaque color, like show-card colors, is the best for this work, because it dries quickly and does not sink in, although water colors will do.—E. J. TANGERMANN.



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WHILE DRIVING HER  
DAUGHTER TO SCHOOL"**

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When it comes to building a tire that really saves motorists lives by providing them with protection against high speed blow-outs my hand goes to Goodrich engineers. They invented the Golden Ply and put it into every

Goodrich Silvertown Tire. This Golden Ply is a layer of special rubber and full-floating cords, scientifically treated to resist *internal tire heat*, which I understand, is the great, unseen cause of blow-outs. Let's all be careful about tires as well as driving! Remember, you can buy these life-saving Silvertowns at Goodrich Silvertown Stores and Goodrich dealers everywhere—and Silvertowns actually cost less than other super-quality tires.

*Graham McNamee*

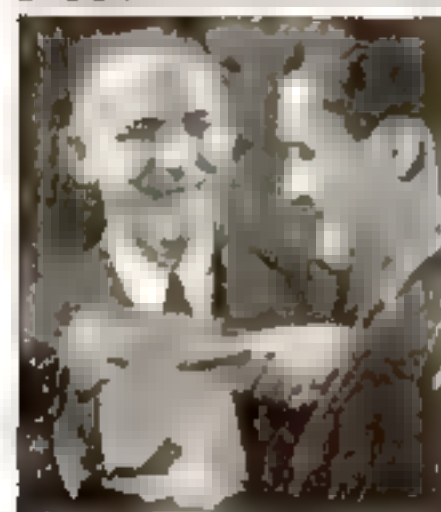
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## THE DECK WORK ON OUR BRIG MODEL

(Continued from page 93)



The windlass, Samson post and bell, bowsprit butts, catheads, and inside of bulwark at bow

plywood, 1/16 in. thick, joined down the center. Two halves are much more easily fitted than one piece right across. On them are marked the plank seams and nibbling strakes with a very hard pencil. (The nibbling strakes are twice as wide as a plank and lie against the waterways.) Lay one half of the deck in place and on it mark the position of the masts and other parts; also the openings for the hatches, which are cut out before laying the deck permanently. Glue the deck pieces down and lightly nail them to the sidepieces and deck beams.

Some model makers delight in showing a lot of nailheads in the deck and the butts where the planks join, but in a real deck all the fastenings are covered with dowels and the butts are hardly discernible.

The catheads were actually stout, grown knees, but if the grain of the wood used for making the miniature catheads is nearly in line with the extended part, that will serve. Outboard, the catheads are 3/16 in. square and rather more inboard. They fit on the main rail and against the inside of the bulwarks and second timberheads down to the deck level, and lie at a right angle to the bulwark at that position. Underneath, outside, are small knees to help support them. At the ends are four holes representing two sheaves for the cat tackle. On the fore side are three firmly fixed eyebolts, and one abaft for the ring stopper.

The headrail can now be placed. It is straight in plan, but curves down somewhat sharply. One end butts against the cathead knee, and the other is nailed abaft the trail-board to the beak.

The bulwarks and waterways of American ships were frequently painted blue, green, red, or brown, but I painted the inside bulwark white and the covering boards and waterways blue. The main rail is black, and the deck is varnished.

No deck plan is to be found for this vessel, so I provided what a vessel of the *Malek Adhel's* size and period would almost certainly have (see March issue, p. 78).

Right forward are the bitts to hold the bowsprit heel in position. The bowsprit tapers slightly from the stem and has its end squared to fit snugly between the bitts and their crossbeam. The uprights must fit tightly in the deck and in the holes we left in the piece underneath. The crossbeam is mortised into the bitts.

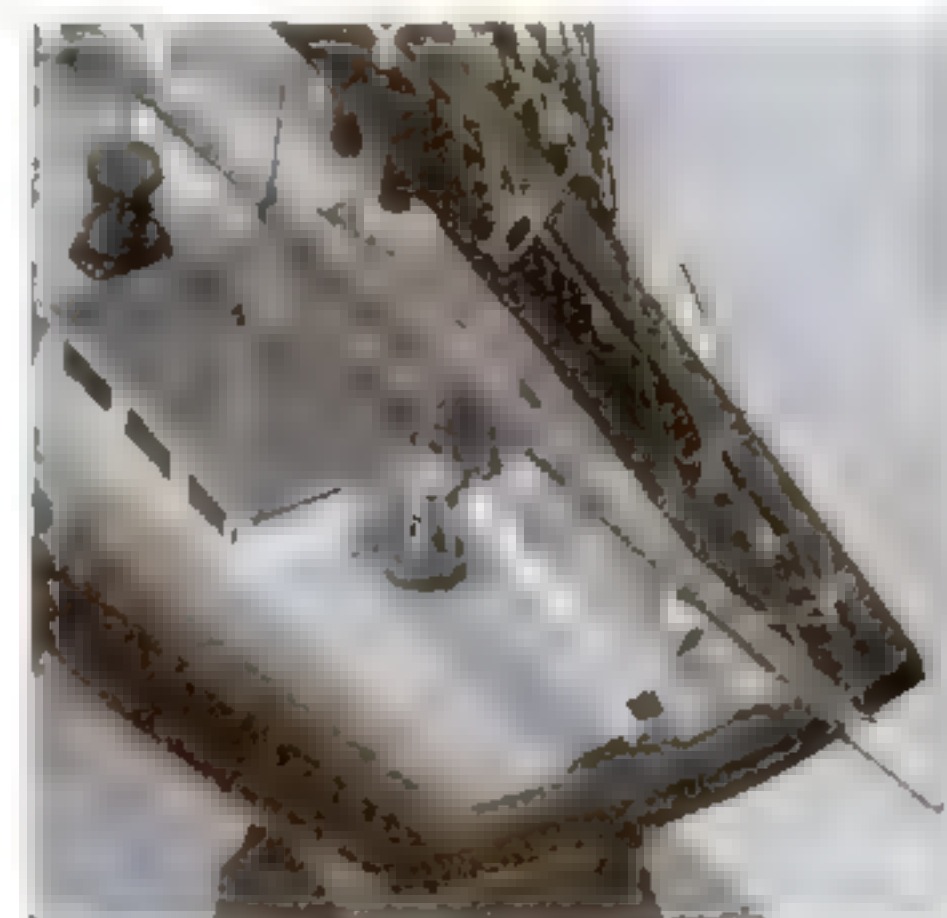
There are three openings in the deck: one forward for the crew to descend to the fore-castle and to ventilate the galley; the main hatch; and one aft for the skylight. The coamings (sides) of all are of 1/8 in. wood,

set down on the beams tight against the deck edges. The corners can be half-lapped, or the ends may merely overlap the sides.

The hatch coamings have a square rabbet on the inside, one half their thickness. The forward hatch has another cross bar about a third from the after edge, which is really the top edge of a bulkhead. The fore part is covered with a grating, as is the after part except one corner, which is covered solid with a round disk representing the plug in the galley funnel (or you may put in a funnel about 3/16 in. in diameter and 1 1/2 in. high).

The main hatchway is covered with a piece of 1/16-in. wood, scored across to represent four hatches. In diagonally opposite corners of each I cut a hole halfway through, and in each set a ringbolt for a handle as shown in an accompanying sketch. In the sides of this hatchway I set small pieces of flattened wire bent to a right angle for batten cleats to fasten the tarpaulin with. The hatchways are black with natural-color gratings and hatches.

I used two 1/16-in. thick pieces for the sides and forward end of the cabin skylight. To make one side, cut the windows out of both thicknesses together. On the inside of the outer piece, file grooves, and set pieces of brass wire in them. Over this glue a piece of cellulose from a cigarette package. Then glue the two pieces together. The after piece is solid 1/8-in. wood with a square piece glued to it to make the upper half of the doors, on which panels are carved. These pieces are set in position on the deck beams; then a very thin top is put on to overlap slightly. The wedge-shaped sidepieces are set up from the door piece; and a half-length thin piece goes on top to make the slide, with a batten on



View at stern showing the tiller, compass binnacle, cabin skylight, and the capstan beyond

either side to hold it in place. The sides of the skylight are white, with white or natural top and doors.

There are identical topsail sheet bitts and five rails at each mast. The bitts are 3/16-in. square posts with two athwart sheaves in each—one for the topsail sheets and the other for the lower yard topping lifts. Into the front is mortised a crossbeam, and to the back extends a pinrail, which is supported at its after end by a turned stanchion. These fittings are painted white.

The windlass barrels and shaft (see drawing on page 79, March issue) are turned from hardwood (degum, otherwise known as lemonwood, or boxwood is best), but they can be made with knife and files. The center Larrel is like a wide cogwheel to take the center pawl from the Samson post. Next on each side is a large cog, which is engaged by the ratchet from (Continued on page 107)



## WE FINISH DECK WORK ON OUR BRIG MODEL

(Continued from page 106)

the crossarm; then the barrels for the chain; then a piece of shaft, where the carrick posts support the barrel; and outside, a small barrel for ropes. The side posts are made in two pieces, bolted together, with the shaft between. They are set well into the deck, and to their fore side is fastened a long knee.

The Samson post is set immediately forward of the center barrel. From it hangs the pawl to prevent the windlass from running backwards, and on the fore side is pivoted the cross arm into which long bars fit. From this cross arm hang wires connected with ratchets on the barrels, so that when the center heaver is raised, the ratchet turns the windlass and thus heaves in the cable.

**O**N TOP of the Samson post, with a bent wire bracket, I set the bell.

Just abaft the foremast are the chain pipes leading to where the chain lockers should be. These are short lengths of tube, about  $\frac{1}{8}$  in. in inside diameter, driven into the deck and extending about  $\frac{1}{8}$  in. above it.

On either side of the hatch are two ringbolts to stopper the cable to, and similarly by the main hatch, three ringbolts to a side.

The mooring bitts are posts set into the deck with crossbeams mortised into them.

The compass binnacle can be of the turned-brass standard type on a wooden base (I found a little compass to set in mine), or it can be of the old style box type, which is like a cupboard; on one side of the shelf is the compass and on the other, the lamp.

The capstan is a small one of the merchant-ship type with six bars and six whelps.

Eyebolts are needed in the waterways as indicated on the deck plan. These are for the anchor-crown lashing, halyard blocks, and boom-sheet blocks.

The tiller should be of hardwood to fit over the rudderhead. It tapers to the end, where there is a larger square, with the corners cut off. It looks well varnished.

The name MALEK ADHEL and port of registry, NEW YORK, should be painted across the stern, and the name on either bow.

There should be a boat to rest on the main hatch. I made mine solid, with the plank edges cut in; then cut it in half and inserted the stern and keel in one piece. It can be made open with the usual thwarts and fittings, but mine has the canvas cover on. This is a piece of thin linen with a glued hem and is glued on to overlap the sides a little. The boat rests in chocks fastened to crossbars (skids) which lie on the hatch, and is lashed down. Paint the boat black or white.

(To BE CONTINUED)

## CROSSWORD SOLUTION

(For puzzle appearing on page 100)

C	A	R	A	T	C	A	T	B	A	T	O	N
T	A	P	E	R	C	H	U	R	N	A	U	G
A	N	S	A	T	E	A	R	E	A	M	P	E
R	E	E	D	A	B	R	A	S	E	D	S	E
N				D	R	U	M	T	A	R	E	I
I	M	P	R	I	N	T	A	S	O	N	O	R
S	A	E	M	E	T	A	T	A	T	I	C	O
H	I	N	G	E	D	C	O	R	T	H	A	W
N	E	N		S	A	M	O	A	A	S	U	
S	T	R	E	S	S	R	I	M	C	S	H	A
H	O	E		I	O	N	I	Z	A	B	L	E
A	P	P	R	O	V	E	E		O	A	R	S
P			N	I	B	S	E	L	M	S		E
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S	N	A	R	E	M	E	T	O	L	A	L	O
D	R	O	S	S		W	O	W	S	M	E	L



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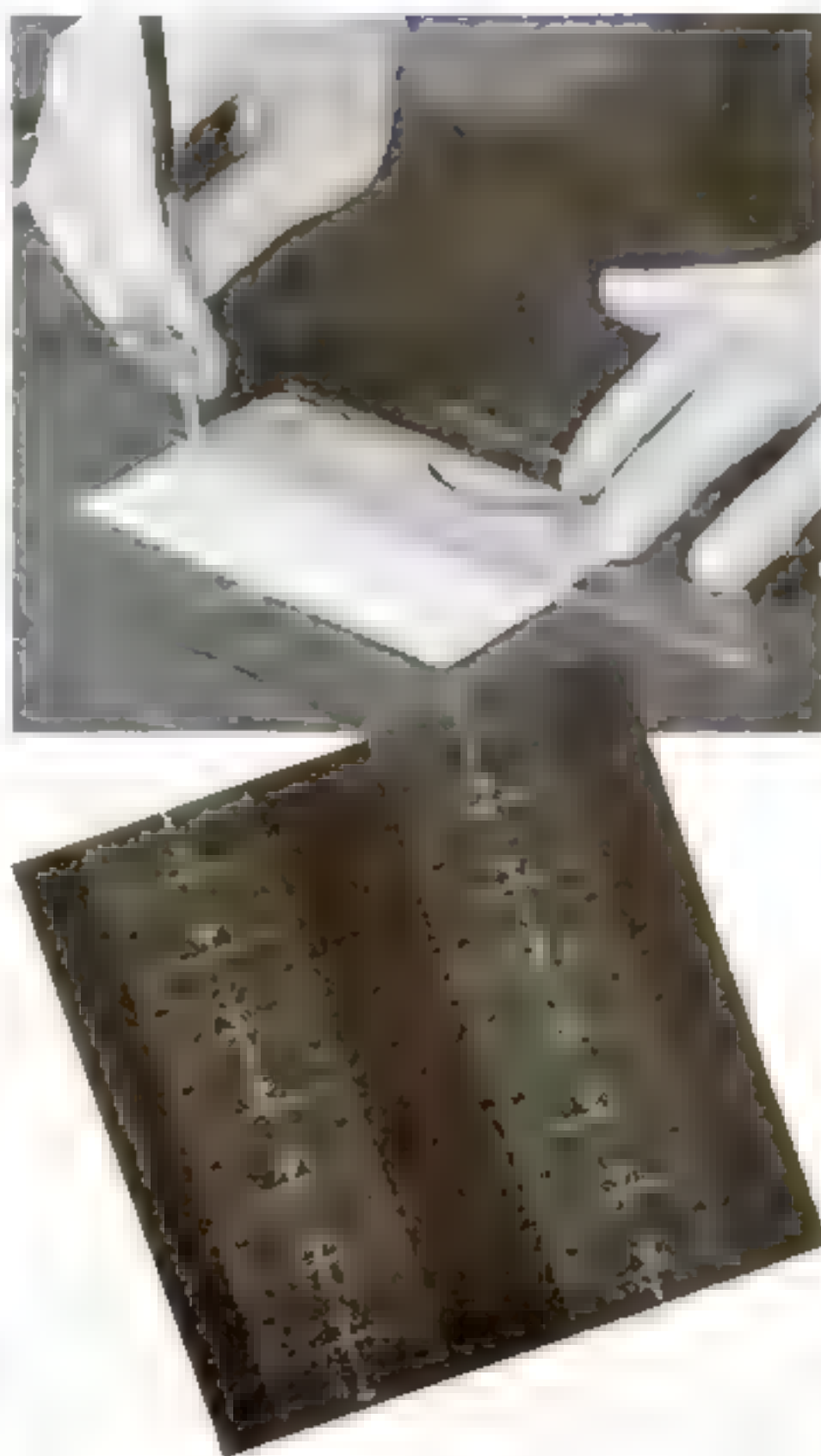
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## METHODS OF IMPROVING YOUR HOME MOVIES

(Continued from page 96)



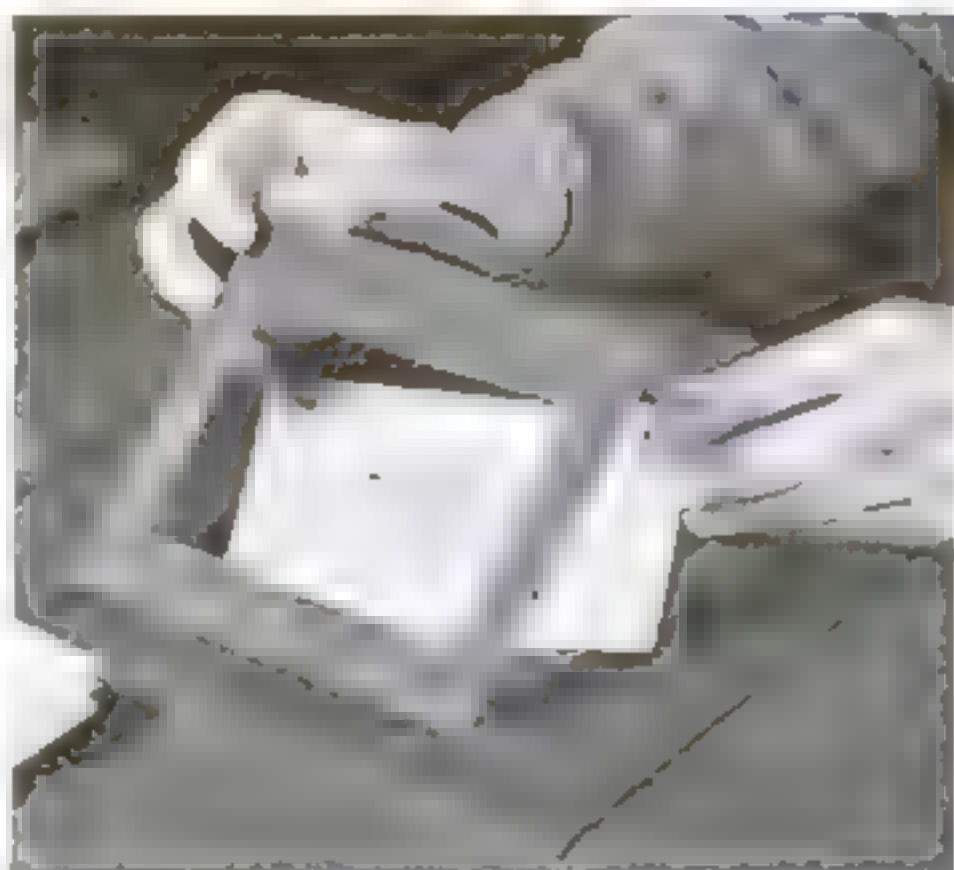
The test card and two trial shots used in checking the adjustment of the titling stand

circle in front of the lens. The set of filter holders shown were made of thin wood, the hole being grooved in such a way that a snap ring of spring wire serves to hold the gelatin disk in place. A small wooden box into which the filters fit will give them adequate protection when carried in the pocket.

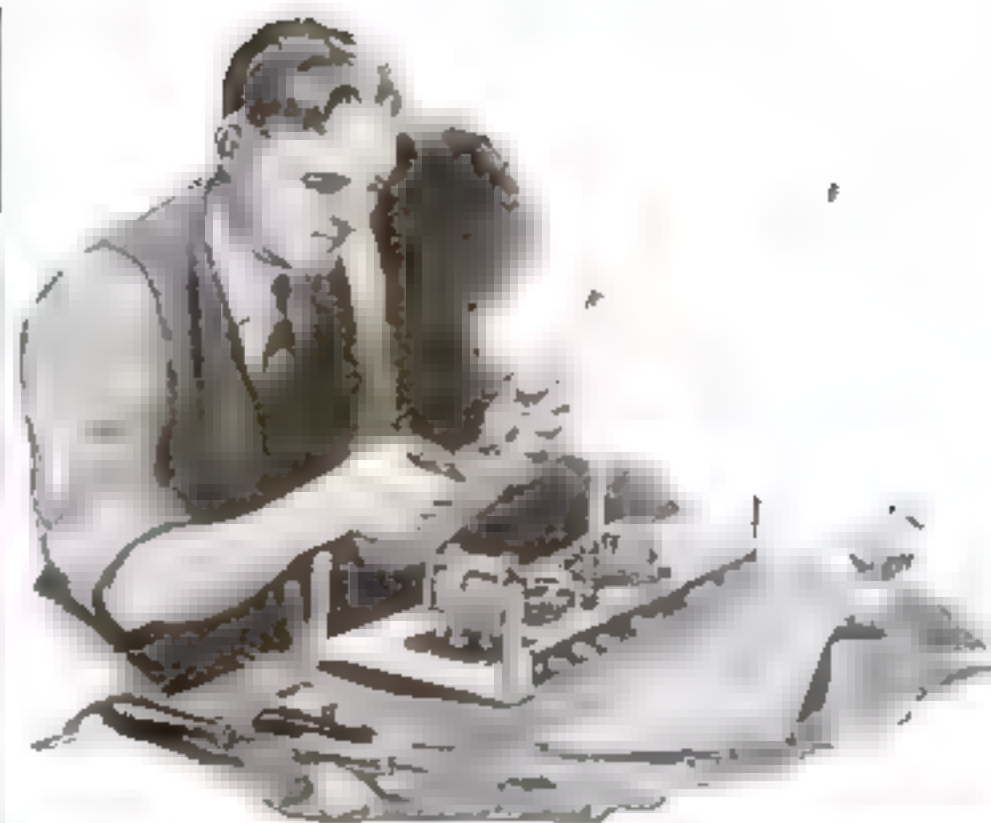
Many types of amateur movie cameras make no provision for adjusting the finder to take in the field of view of wide-angle lenses. Some do not even have rectangles marked to indicate the smaller field taken in by long-focus and telephoto lenses. Others have one or two rectangles marked, but they may not match the telephoto lens you buy, and in any case it is very easy to make errors when working with small rectangles marked out inside a larger field of view.

Any one of these problems can be solved by fitting a supplemental lens over the regular finder lens, which will alter the field of view to match any type of movie lens.

Don't bother to (Continued on page 109)



Titles are made to appear against any type of background by using a photographic overlay



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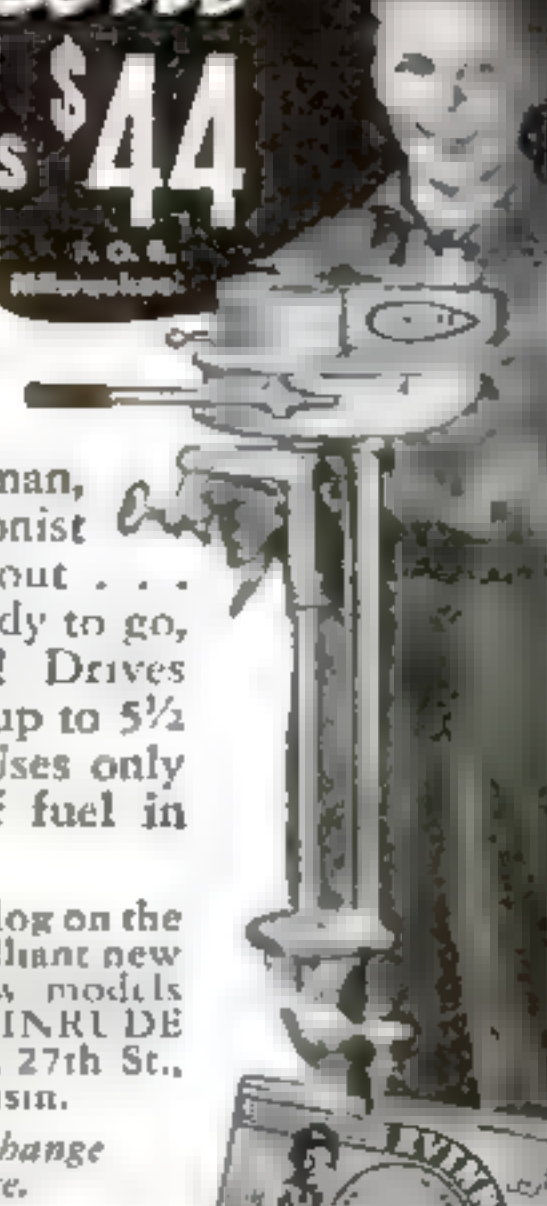


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## METHODS OF IMPROVING YOUR HOME MOVIES

(Continued from page 108)



A piece of parchment was photographed with a plate camera to get this overlay for titles

ask for such supplementary lenses at a camera store. There are none for sale so far as I know. First determine by actual test on film the width of field taken in by the new lens at any convenient distance, say 15 or 20 ft. Now take the camera to any good optician and have him hold various test lenses in front of the direct view-finder lens till he finds one that so changes the field of view as to permit you to see a width corresponding to the view taken in by the new lens. For about a dollar and a half or perhaps a trifle more, the optician will supply you with a simple lens of the required strength ground down in diameter to any figure that will make it easy for you to fit it to a simple sheet metal or cardboard holder. When you use the special movie lens, slip the supplemental lens in place in front of the finder as shown.

Nothing detracts more from home movie films than titles that are not level or properly centered. The home movie fan, especially if he has built his own titling stand, often wastes hours in trying to get his titles to appear level and centered.

A quick and accurate way to do the job is to prepare a card with heavy vertical and horizontal lines. Letter on a word like "top" to indicate which side is up. Place the card so that the lines bisect the picture area in each direction, as shown. Shoot a foot of film. If the card frame is level with the camera, the vertical line will form a continuous line down the center of the film.

To determine with ease whether the title card frame is centered up, down, or sideways, cut the test strip in two and look through two thicknesses with the two strips face to face and the indicator in opposite directions. If, with the edges of the film and either the sprocket holes or the frame outlines matched, the lines do not overlap, the desired correction is obvious from the relation of the lines.

Figured or patterned title backgrounds add much to the attractiveness of amateur movies. However, obtaining a supply of paper with just the right pattern is often difficult. An easy way out of this difficulty is to letter the title on plain white paper and take a picture of the desired background with a plate or film camera, using a very short exposure so that the texture will be very faint. The selected background may be photographed from a piece of parchment, a rough plastered surface, a figured wall paper, a finely grained piece of fancy wood, or any other surface.

If photographed on a glass plate, the plate is used directly over the title card, emulsion side down; if you use roll film or pack film, a plain piece of glass will have to be placed over it to get good contact. By adjusting the distance of the camera from the surface you are taking, the apparent coarseness or fineness of the pattern on the movie screen can be altered.

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on the  
Screen!*

**"POPULAR  
SCIENCE"**

*Produced in Cinecolor by Carlisle & Fairbanks with the co-operation of the editors of Popular Science Monthly*

*A Paramount Picture*

### MAPLE LONG TABLE

*(Continued from page 80)*

and "softened." The amount of radius will vary on the different parts. That on the edges of the top should be about  $\frac{1}{8}$  in. Left with square edges, the tables would give a harsh and uncompromising appearance, but with a radius on every corner its entire air will be changed.

The table shown in the photograph has been finished with linseed oil and polished with wax. Time and usage are expected to supply a deepening color. For those who cannot wait, staining will give a mellowed effect and make the table fit in more harmoniously with other pieces.—ARTHUR COLLANI.

#### LIST OF MATERIALS

##### MAPLE—FINISHED SIZES

No. Pc.	Description	T.	W.	L.
4	Legs	2 $\frac{1}{4}$	2 $\frac{1}{4}$	29 $\frac{1}{8}$
2	Side skirts	1 $\frac{1}{2}$	4 $\frac{3}{8}$	45 $\frac{3}{4}$
2	End skirts	1 $\frac{1}{2}$	4 $\frac{3}{8}$	19 $\frac{1}{4}$
2	Side stretchers	1 $\frac{1}{2}$	2 $\frac{1}{8}$	45 $\frac{3}{4}$
2	End stretchers	1 $\frac{1}{2}$	2 $\frac{1}{8}$	19 $\frac{1}{4}$
2	Top	$\frac{3}{8}$	14 $\frac{3}{4}$	67 $\frac{3}{4}$
4	Butterfly keys	$\frac{1}{2}$	1	1 $\frac{1}{2}$
2	End cleats	$\frac{3}{8}$	2 $\frac{1}{4}$	29 $\frac{1}{2}$
2	Battens under top	1 $\frac{1}{2}$	2 $\frac{1}{2}$	17 $\frac{1}{2}$

##### MISCELLANEOUS

3 pc.  $\frac{3}{8}$ -in. maple doweling 36 in. long

8 wood screws, 2-in. No. 10

Glue, boiled linseed oil, polishing wax

##### MATERIAL COST TO AUTHOR

Maple lumber, 47 ft. board measure at 15 cents	\$7.05
Doweling	.15
Glue, screws, boiled linseed oil, and polishing wax	.60

Approximate hours labor (estimated)	60
-------------------------------------	----

### MATERIALS FOR TRAILER WITH WELDED FRAME

*(Described on page 86)*

	Weight	Cost
Essex front axle complete	150 lb.	\$ 3.00
Chevrolet rear springs and hangers (2)	20	1.00
Pontiac (1929) frame	35	1.00
Pontiac (1929) snubbers	10	.50
New tires 20 x 4 50 (2)	20	14.00
Angle iron 1 $\frac{1}{2}$ x 1 $\frac{1}{2}$ x $\frac{1}{8}$ in. (100 lineal ft.)	123	
Channel iron 2 x 1 x $\frac{1}{8}$ in. (8 lineal ft.)	12	
Angle iron 1 x 1 x $\frac{1}{8}$ in. (40 lineal ft.)	36	
Angle iron $\frac{3}{4}$ x $\frac{3}{4}$ x $\frac{1}{8}$ in. (86 lineal ft.)	50	
T-iron 1 x 1 x $\frac{1}{8}$ in. (120 lineal ft.)	108	
Half-oval iron $\frac{3}{4}$ x $\frac{1}{2}$ in. (40 lineal ft.)	7	
No. 16 gauge plate 1 ft. 6 in. x 6 ft. 3 in.	23	
8 ft. of $\frac{3}{8}$ -in. black iron pipe	4	
Cost of above metal and pipe		18.00
2 pc. plywood $\frac{3}{8}$ in. x 4 ft. x 6 ft. 4 in.		
1 pc. plywood $\frac{3}{8}$ in. x 4 ft. x 4 ft. 2 in.	92	4.70
300 sq. ft. pressed composition wood	200	24.00
600 stove bolts $\frac{1}{4}$ x $\frac{1}{2}$ in.	5	1.80
Fenders	10	2.00
7 windows (wood frames)	25	5.25
100 ft. sponge rubber weather strip		1.25
7 wind-shield hinges	5	1.00
7 pr. desk slides for windows		1.40
Electrical supplies		5.00
Hardware		3.00
Sink	10	3.00
Water tank	10	3.00
Paint		5.00
Ice-box fittings and lining	10	2.00
Material for seats, cabinets, etc.	30	10.00
Welding labor (200 joints at 5 min. equals 16 hr.)		30.00
	995	\$139 90



# How to Finish Book Ends and Similar Small Craftwork Pieces

Finally the book ends were given a light brushing with floor wax, dried a few minutes, then dusted freely with powdered rottenstone. After standing half an hour, they were polished with a clean bristle shoe brush. If a new brush is not available, wash out an old one with gasoline and let it dry. By using the rottenstone over the wax, the new and slightly raw look is lost, and the work really seems like an old bronze work of art.

**S**INCE I had considerable veneer stock on hand, I felt that I should like to design other types of book ends. Those appearing in the circle were one result. A basswood block was covered on the face side with American walnut burl veneer and on the back with a plain rotary-cut piece. Enough stock was veneered at one clamping to make both book ends. It was afterwards cut across the butt center line, and the pieces were then clamped with the burl faces on either side of a clean, well-sanded piece of softwood to dry evenly for a week. Never finish freshly veneered work.

The base moldings were next made up, the face blocks band-sawed to profile, the edges sanded, sponged, dried, and then resanded with 4/0 paper. Then the aluminum foot plates were housed beneath the bases, the ends and bases assembled, and the entire piece inspected for spot sanding with used 4/0 paper.

Since the burl on the end faces was rather dark, it was necessary to stain the base, edges, and backs first with full-strength water stain of the brown mahogany or black walnut type. While the main parts were still damp, the untreated burl was stained with one part of walnut reduced with two parts of water, and the veneer was wiped with a clean cloth.

(Continued from page 79)

The work was set aside to dry overnight.

In order to tone up the walnut slightly as well as to seal the wood in preparation for the filler coat, one part of orange shellac was cut with an equal amount of white, and this mixture was thinned with five parts of denatured alcohol as made for shellac work alone and not for auto radiators. The shellac was applied with a soft bristle brush, dried three hours, and sanded with old 6/0 finishing paper, which had been well crumpled and then straightened out.

Following the sanding, the entire work was given a coat of filler made from silex and colors ground in oil according to the formula previously given (P.S.M., July '36, p. 90). Similar walnut filler of the silex type can be had at paint stores and should be reduced with a thinner made of one part pure turpentine and two parts gasoline at the rate of 12 to 14 lb. to 1 gal. for walnut and mahogany. If kept sealed in a tight can in a reasonably warm place, such a filler will remain in good condition until used up.

After the filler was applied, wiped clean, inspected, and the molding fillets and joints run with a rag and picking stick, the work was allowed to dry for twenty-four hours.

Next a four-hour floor varnish was well brushed out in a thin even coat and allowed to dry over night. Old 4/0 paper was used to sand the work smooth and level. It is important to avoid cutting through on the edges, which are presumed to have been adequately sanded free of sharpness.

This work completed, the book ends were carefully dusted, tack-ragged off, and a full-bodied coat of the same varnish was flowed on with an absolute minimum of brushing.

Next a hair-line artist's brush was used to pick out any lint before the varnish surface set, after which the work was put aside to dry in a warm room for a week.

**F**OR the final finish, the dried varnish was rubbed with crude oil, FFF pumice stone, and a hard felt pad. When the rubbing was complete but the resulting sludge still remained on the surface, cotton waste was squeezed slightly free of water and used as a pad to rub the work with the grain of the wood. A final clean-up was given with brush, oil, and cloths. Felt was cemented to the lower face of the aluminum plates.

The modern-style book ends shown in the other illustrations are veneered blocks with  $\frac{3}{4}$  by 4-in. lead slugs placed in borings in the base for stability. For one pair I used walnut veneers with a cross-ripple figure on the side faces and quilted maple veneer on the curved profile; for another, silky oak from Australia on the sides and satinwood for the profile. Part of the modern practice in furniture finishing calls for bleached effects, and it seemed desirable to use an ivory or bone-white finish on the maple base strips and maple veneer to contrast with the darker veneers. To accomplish this, use was made of a modern antiseptic liquid employing a stabilized chlorine solution and obtainable at any drug store.

No stain was needed on the veneers because they had been chosen for their color values as well as beauty of grain. The woods were sealed with a much-reduced coat of clear brushing lacquer. No filler was used. After drying, the sealer was sanded with used 4/0 or 6/0 paper and given a coat of four-hour varnish. The remainder of the finishing was as previously described.

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labels on a piece of paper, or putting them in an envelope, and sending them with your name and address to Fleischmann's Yeast, 701 Washington St., New York. (This offer holds good until August 31st, 1937.)

(Details of securing Dance Book differ slightly in states West of Denver and in Canada, see newspapers or ask your local grocer.)

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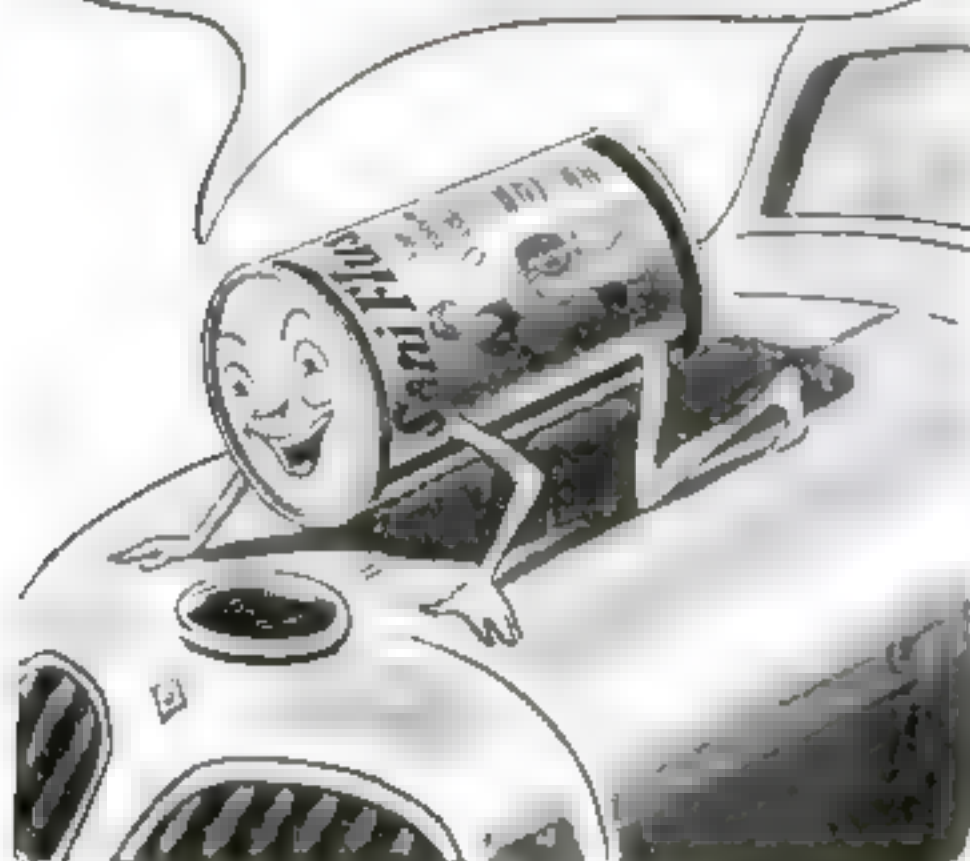
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HERE I COME!



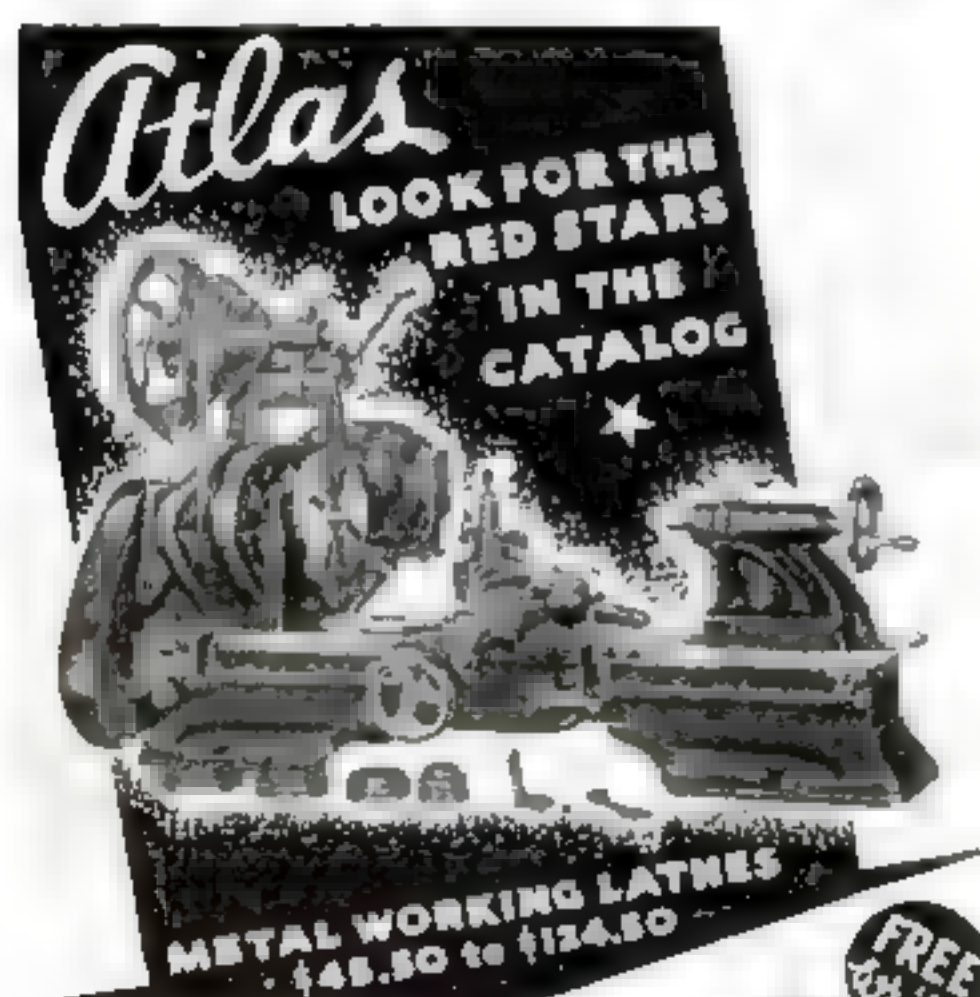
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(Continued from page 112)

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Winnie Mae, 4-ft. Flying Scale Airplane Model, 141-142-143.....	.75
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(Construction kits are available for  
some of these models. See page 20.)



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## 57

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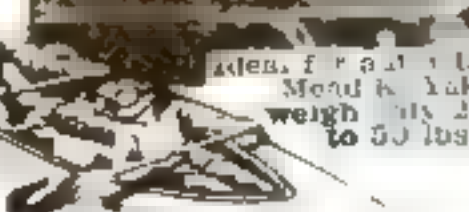
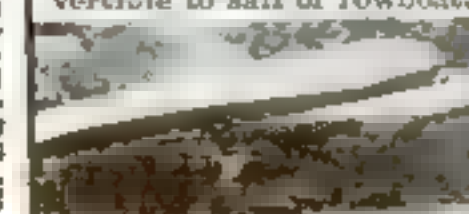
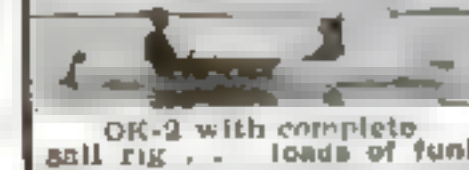
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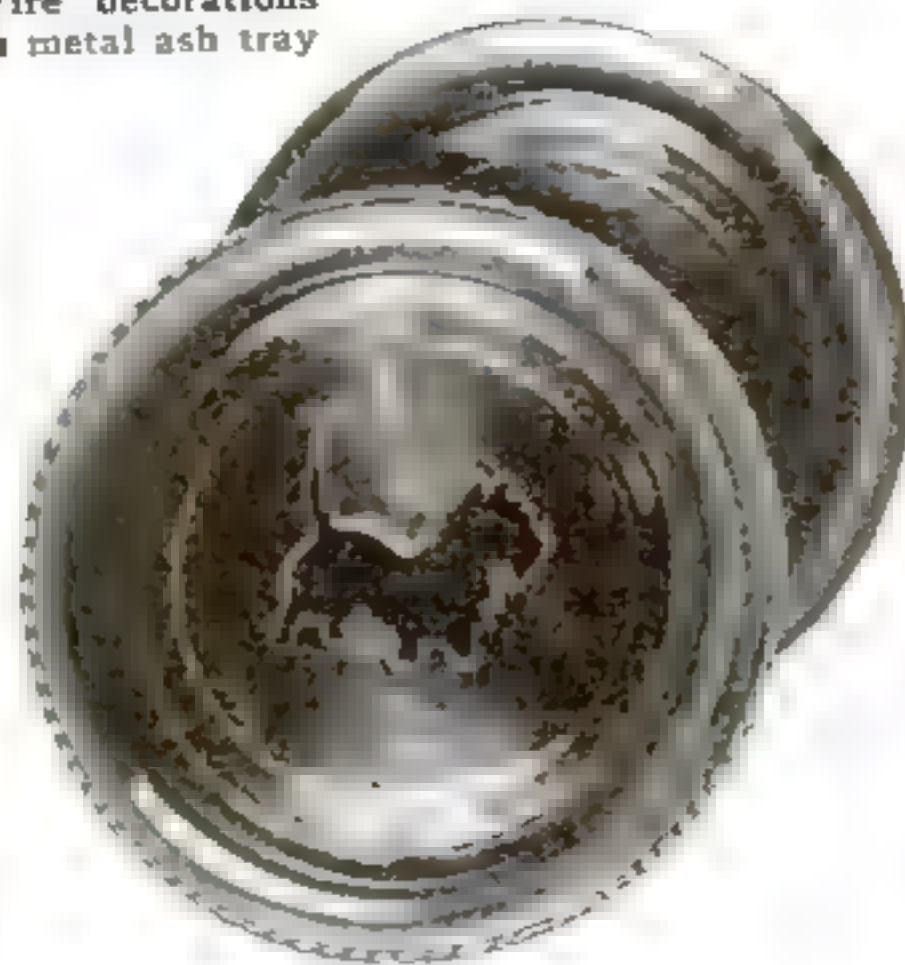
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The 3-1 OK-2 makes rowing a pleasure!



Wire decorations on metal ash tray



### SMOKERS' ACCESSORIES

(Continued from page 83)

sign was made with twenty 1-in. pieces of square wire bent into crescents and assembled with solder from the back, so that the front would require little finishing.

The appearance of a drum was given the cigarette server illustrated last month. It was made from a ten-cent combined humidor and ash tray. The bands are of round wires twisted together and then flattened; the "ropes" are of small twisted square wire.

Perhaps you prefer a pipe! The holder illustrated at the beginning of the article was made of half-round wire, twisted; the base is a 2 1/2-in. ring, with the upper part formed from a separate piece. To go with it, a pipe reamer may be made.

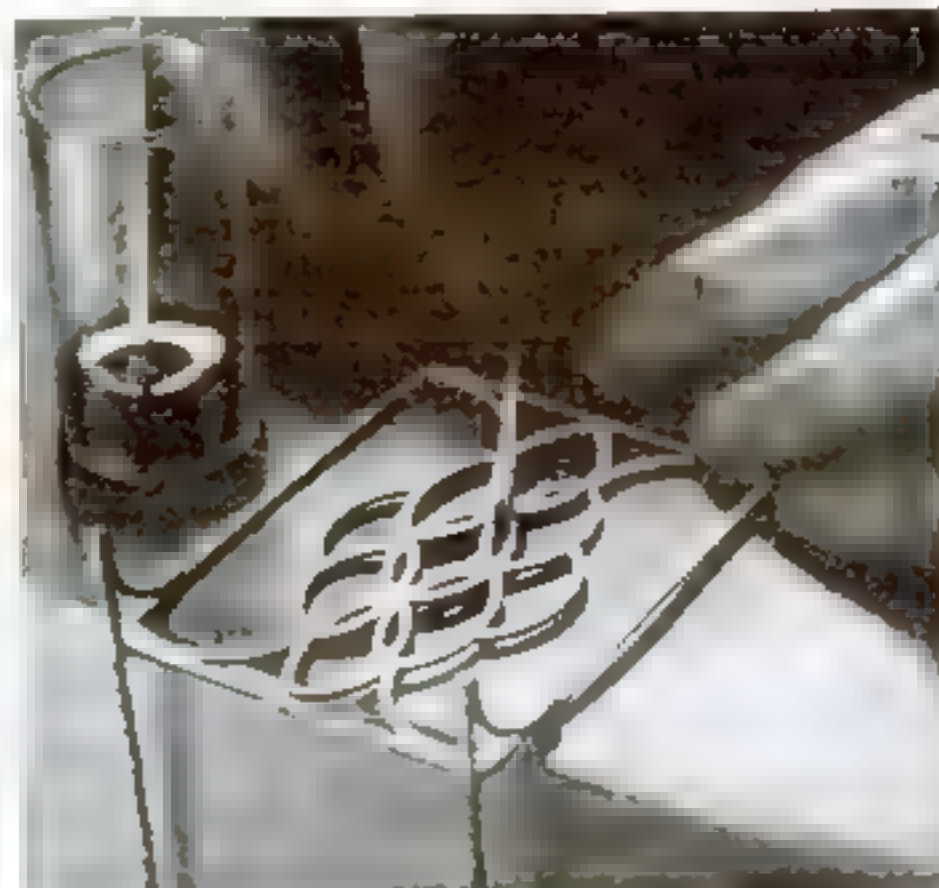
To file wire to a point before drawing it, merely file a tapered notch in the end of a piece of hardwood, then clamp it down.



Pointing a wire in a notched board so that it is easy to start through the drawplate

In order to cover soft solder with a film of brass so that soldered joints are not visible, first apply a coat of strong copper sulphate solution; and on rubbing it with an iron wire, copper will be deposited. Wipe off the solution and again coat the joint with a strong solution of equal parts copper sulphate and zinc sulphate; on rubbing with a strip of zinc, the color will change to that of brass.

If you would like additional wire-work articles to be prepared, please send a post card.



Applying a brass finish to the cigarette holder to color and hide the soldered joints

# D I G



in the deep, dark water...

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## GIANT MOVIE SETS

(Continued from page 38)

cyclorama was deep blue in color, and spiraling upward from right to left was depicted the Milky Way in flashing automobile tail-light and head-light globes.

Troubles seldom come singly to these wizards in construction. Not long ago, the production department at the Warner Brothers studio received orders to build a thirty-ton revolving water fountain which not only must revolve, but must be lifted silently twenty-two feet during the filming of a scene. And it must be ready for shooting in ten days!

**FRANK N. MURPHY** and **Louis Geib**, production managers, ordered cots placed in their offices and tackled the job. First, they laid out detailed plans. The foundry must fabricate twenty-six tons of steel forms and provide a hydraulic jack capable of lifting the set. From the mills must be delivered, in three days, 820 pieces of lumber. Carpenters, plaster workers, tinsmiths, and tailors received their orders. Another group of workmen must cut a hole twenty-five feet wide in the floor of the stage, dig it thirty feet deep, and lay a concrete foundation for the jack. There they encountered trouble: that part of the stage was built over quicksand.

For two days, carpenters and cement workers labored in that pit, pouring concrete, building water-tight forms, and pumping. On the third day they completed the heavy concrete base. On the fourth, the crew started assembling the big fountain, and one week later the company moved in to find four platforms, one turning within another, and the steel-and-wood fountain moving silently up and down at the turn of a lever—an achievement impossible anywhere but in this land of feverish activity and make-believe.

Few sets are complete duplicates of the places they are intended to represent, but the parts reproduced are as accurate as artist and draftsman can make them. Recently, for instance, a director planned several scenes around the New York end of the Brooklyn Bridge. Obviously, he could not re-create the entire bridge, so he compromised by having the abutments built of wood and heavy paper formed to represent stone, while on a wall in the background was hung a huge photograph of the bridge, fading away in the distance until it virtually disappeared on the Brooklyn shore of the East River.

**Chris Christensen**, a Dane who for twenty-seven years sailed before the mast, is the expert who creates ships of all kinds indoors for the movies. For one recent picture he built two pirate sloops, a schooner, a fishing smack, two French merchantmen, and replicas of the quarter deck, poop deck, and below-decks of H.M.S. *Victory*. Again, he constructed the forward halves of two large schooners on runways, maneuvered them alongside each other by means of wooden tracks and pulleys, and finally pulled them apart again while the cameras recorded a hand-to-hand pirate battle.

**WINDS** of hurricane strength lashed the Mississippi the other day, but the "river" consisted of a pool of water four feet deep, 150 feet long, and fifty feet wide. Sixteen thousand gallons of water tumbled down eight flat-bottom chutes into the pool, while a battery of nine airplane propellers turned by gasoline engines lashed the turbulent water with fifty-mile winds.

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A Back-Gear Screw Cutting Precision Lathe  
Weight 230 lbs.

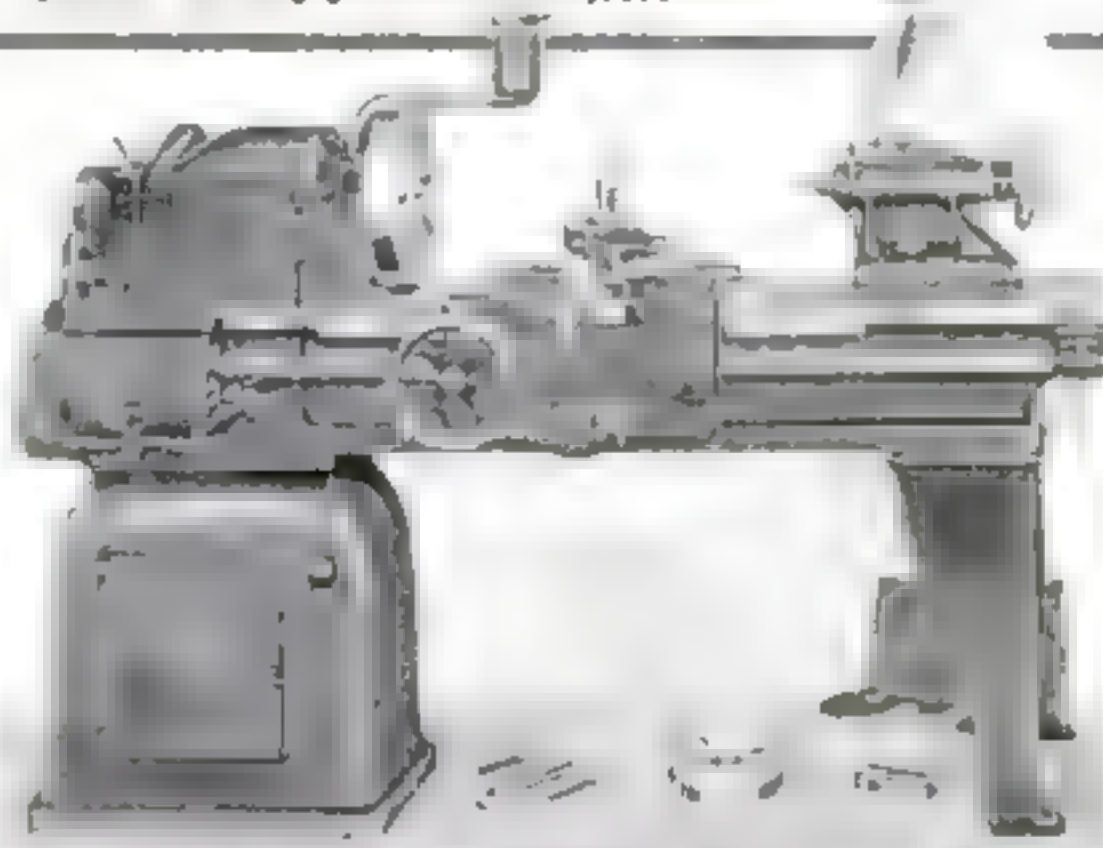
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South Bend, Ind., U.S.A.

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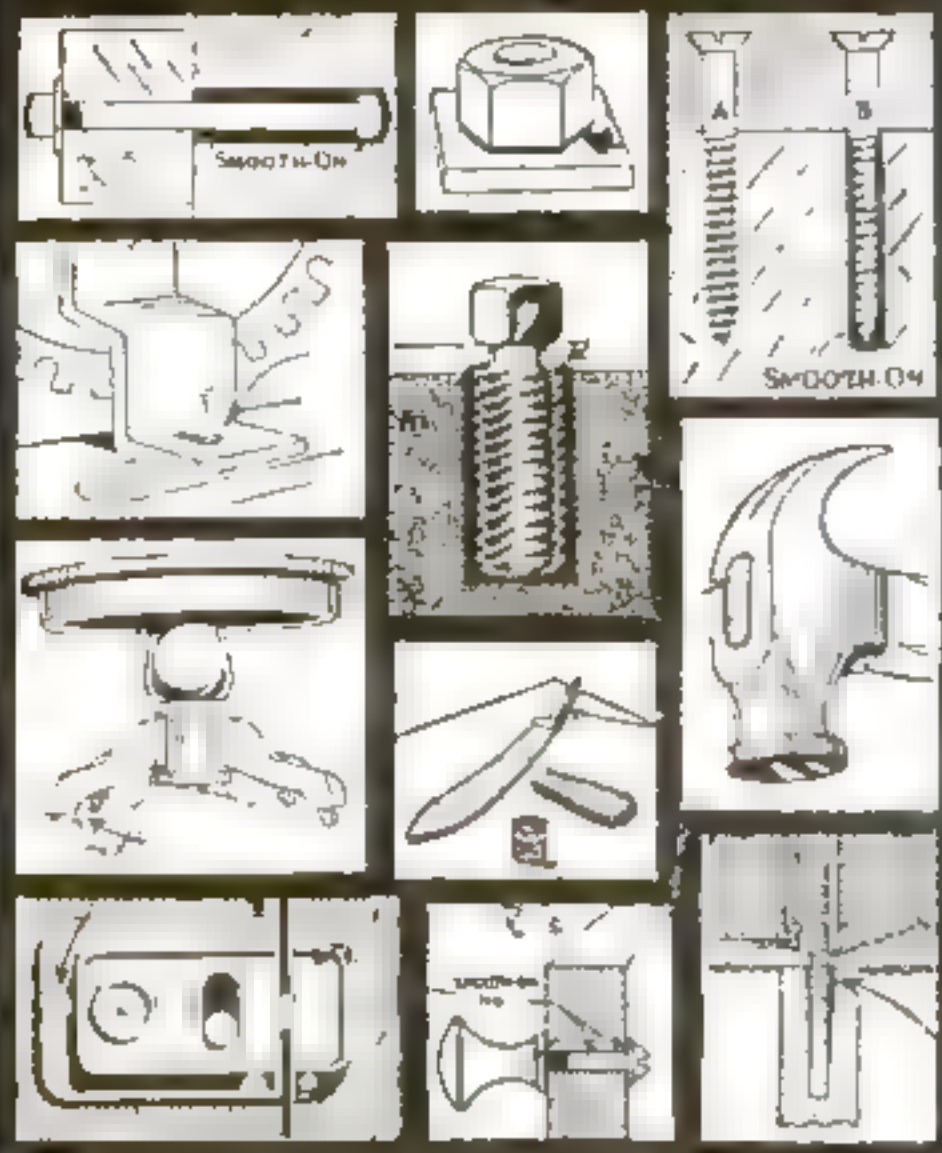
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## NATURE'S JEWEL BOXES THROUGH A MICROSCOPE

(Continued from page 65)

the collected material in a flask or test tube and drain off as much of the water as possible. Add a little hydrochloric acid and boil until the plant material has become almost black. It is a good idea to let the specimens remain in this acid for about a day after it cools. Then add water, let the material settle, and carefully pour off the water. Repeat this several times. Let the flask stand several hours after the final washing, and then pour off all the water possible.

Any remaining traces of organic material may be removed by adding several drops of sulphuric acid, one drop at a time, to the mass in the bottom of the tube, and heating slightly. Organic substances will turn black. Next, add a little piece of potassium bichromate, to remove the blackened portion. Let the contents of the tube cool, and then pour them into a tube or beaker of water. *Never pour water into the tube, for an explosion might result.* Finally, rinse several times with water as described above, and, except for the presence of sand, your diatoms are ready to mount.

**T**O SEPARATE the sand from the diatoms, place the mixture in a test tube half filled with water, and shake. Let it stand until the sand has settled, leaving the diatoms, which are lighter, suspended in the water. Pour off the water and diatoms.

Keep the cleaned diatoms in labeled vials of distilled water to which a little alcohol has been added. When ready to make a permanent mount in balsam, clean a cover glass and slide until no grease film is present. Lay the cover glass on a one by three-inch slide, and this in turn on a perfectly horizontal surface. Now place in the center of the cover glass a drop of water containing diatoms. Put some kind of a dust shield over it, and let the water evaporate. Carefully lift the slide bearing the cover glass, and place it on your microscope stage.

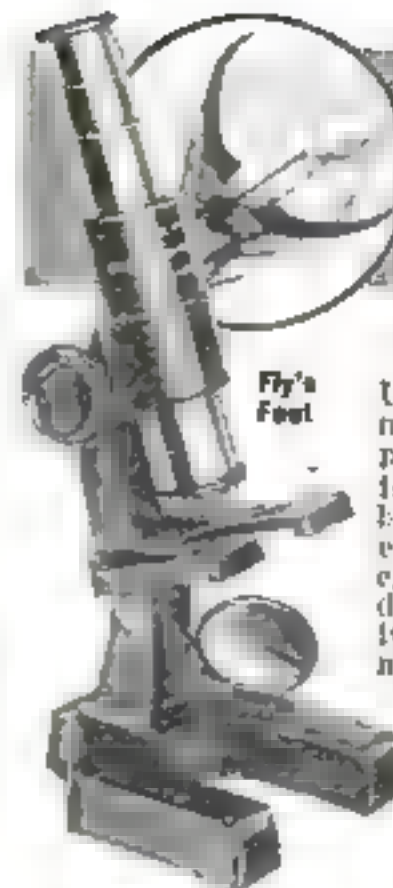
If, on examination, you find that the diatoms are sufficient in number and well-distributed, carefully place in the center of the cover glass a drop of fairly thin Canada balsam. Warm it, if necessary, to make it spread to the edges of the cover glass. When the balsam has hardened, lift the cover glass from its temporary support, turn the balsam side down, and lower it to the surface of a clean slide, that has been previously warmed and had a drop of fresh balsam placed in its center. The cover glass should be pressed lightly into place, with the balsam spreading uniformly to the edges. Do not use more balsam than necessary. Patient workers sometimes produce slides of great beauty by arranging diatoms of various forms in geometrical patterns and designs.

**D**IATOM skeletons millions of years old are available from various sources. Such fossilized remains make up the bulk of diatomaceous earth, or kieselguhr. They are used as ingredients in tooth pastes and powders, and in scouring preparations; and, of course, specimens suitable for microscopic study can be obtained from such sources.

A particularly effective way of examining diatoms with the microscope is to use Rheinberg differential color illumination as recently described. (P.S.M., April, '36, p. 44). A blue center disk with a yellow or very light red ring around it reveals unsuspected beauty.

You can record the wonders you see in diatoms, and in other microscopic objects as well, by coupling a camera to your instrument and making photomicrographs.

There seem to be about as many different kinds of photo- (Continued on page 117)



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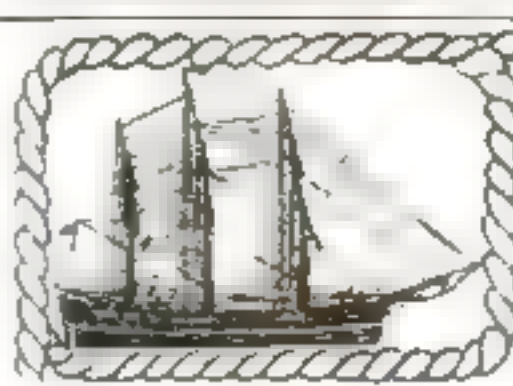
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## NATURE'S JEWEL BOXES THROUGH A MICROSCOPE

(Continued from page 116)

micrographic outfits as there are diatoms. Some of the professional layouts cost more than a high-priced automobile. But with nothing more than a microscope, an ordinary camera, and a few pieces of colored glass or gelatin, you can turn out surprisingly good work.

Although you can juggle a tripod with a tilting head so that the camera it supports has its lens aimed down the microscope tube, it is better to make a special support or coupling. One of the illustrations in this article shows a miniature camera attached to a microscope by a ring made of brass. A similar ring can be built up of sheet celluloid painted black.

The object of such a camera support is to hold the camera lens in approximately the same position as your eye when you are making visual observations. That is, the lens is placed at the eyepoint of the microscope ocular. You can use any kind of camera, from a cheap box type to the highest-priced imported variety.

**S**HARP focus is obtained by the following method: First, put the object, a diatom, for instance, under the microscope, and focus it carefully, just as if you were going to make a visual study of it. Next, focus the camera on some distant object—something 200 feet or more away. This is called the "infinity" setting on focusing-type cameras. If you use a fixed-focus camera, you need not do any lens adjusting. Now support the camera so that its lens occupies the same position that your eye occupied when you focused the microscope. Make the exposure by placing a sheet of cardboard between the microscope mirror and the light source, opening the shutter, removing the cardboard long enough to admit the light for the necessary length of time, and then closing the shutter. By using the cardboard instead of the camera shutter for making the actual exposure, you avoid excessive vibration.

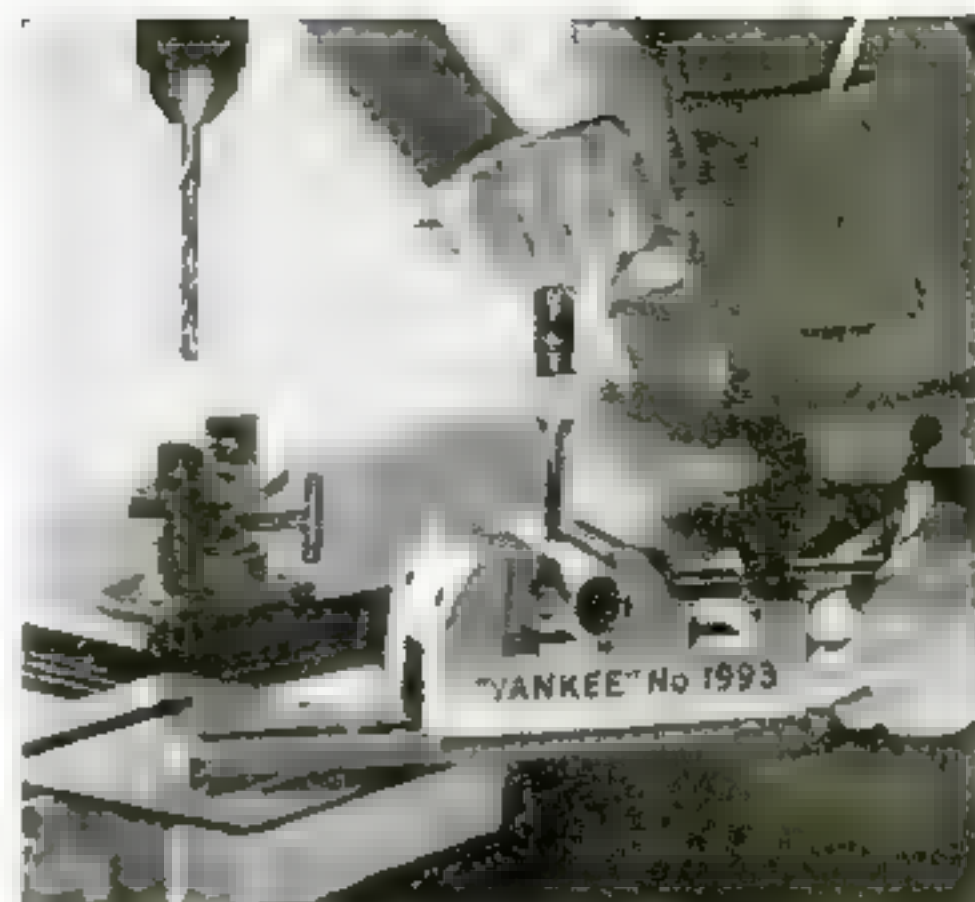
Microscopes perform better if monochromatic, or one-color, light is used for illuminating the object when making pictures. For this, gelatin or glass filters, which permit only light of certain wave lengths to pass, are placed in the light beam, between mirror and light source. For photographing diatoms, green or blue filters generally are used, with green perhaps the more popular.

## SUGGEST ROOFS OF ICE TO KEEP HOUSES WARM

LAYERS of ice to provide extra heat insulation to roofs are among the proposals being considered in studies of air conditioning. Heating engineers point out that a modern, flat-type roof could easily be arranged to retain a two or three-inch layer of water, which, freezing in winter, would conserve heat, especially in severe weather. In summer, the water-covered roof would be part of the spray system for cooling the air-conditioning unit.

## ARTIFICIAL WOODPECKER TESTS WOOD FINISHES

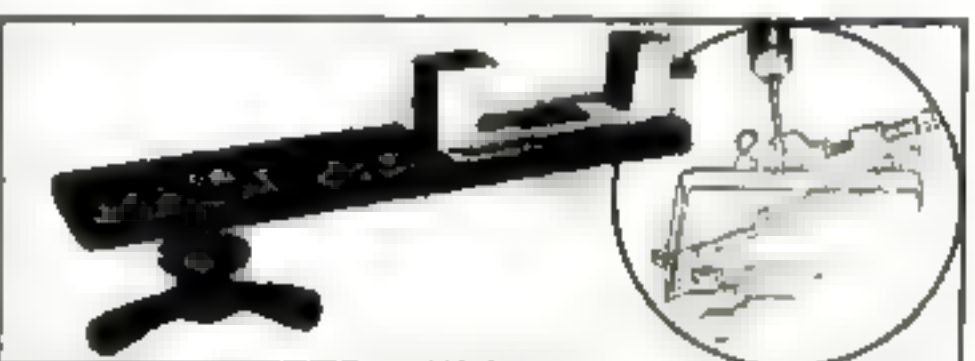
A "WOODPECKER MACHINE" developed by the Bell Telephone Laboratories tests finishes for telephone switchboards by simulating the battering encountered in service. One model of the device strikes a series of direct blows with a ball-tipped hammer, either at one spot, or spread over a small area. Another version of the machine applies automatically increasing, glancing blows as a rotating hammer moves across the sample. A nail, coated with one of the new organic finishes, it is said, can be driven into hard wood without damage to the finish.



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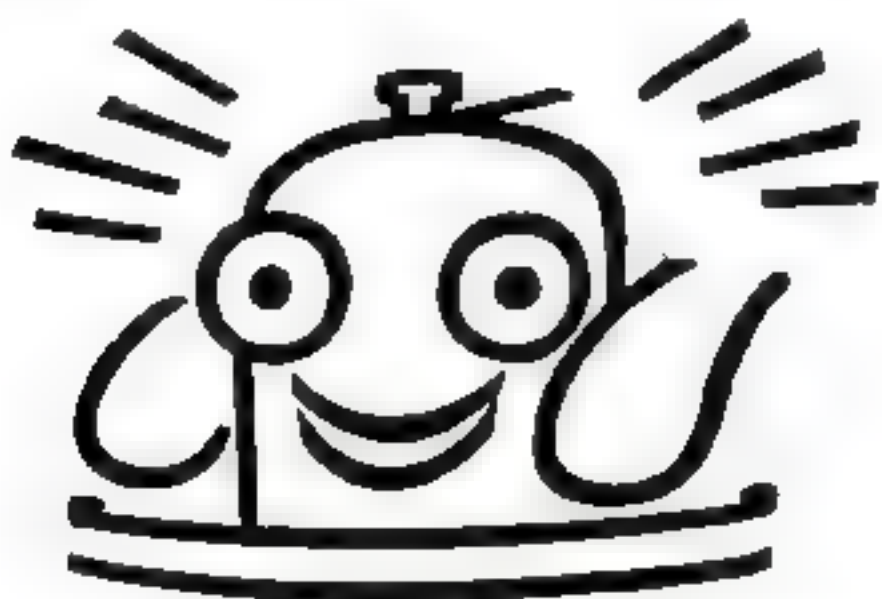
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## BATTLE OF SUPERLINERS

(Continued from page 45)

The outcome of it all was that British designers decided that a hull shape embodying a knife-edge bow and cruiser stern, not very different in general lines from that of fast Cunarders of the past, was just as efficient as more "unusual" types of hulls. On the other hand, French designers maintained that the counter stern was just as effective as the cruiser stern, but that by adopting the Yourkevitch type of hull, with a specially adapted bulbous bow, resistance (and, hence, power required) could be reduced four percent at twenty-eight knots and as much as nine percent at thirty knots.

**I**N DETERMINING the power necessary to drive a ship at a given speed, two types of resistance must be considered. At slow speeds, the chief of these is the simple resistance caused by the friction of the hull through the water. At high speeds, however, what is known as residuary resistance becomes extremely important. This is the resistance due to waves produced at bow and stern, to wind pressure against the superstructure, and to the drag of eddy currents produced about propellers, rudder, bilge keels, and other projections which mar the streamlining of the hull. Of the residuary resistance, that due to wave making at the bow is probably the greatest.

It is the aim of the Yourkevitch design to minimize this resistance. It attempts to do it in two strange ways. The first is to make the hull of the ship as narrow as practicable at the center of water pressure near the bow. This center of pressure is close to the stem at slow speeds, but recedes toward the stern as speed is increased. Instead, then, of the normal gradual widening of the fore part of the ship, as on the *Queen Mary*, the fore part of the *Normandie* is decidedly concave. The lost buoyancy at this point is made up by the bulbous bow.

The resistance is reduced in a second way by making the frames in the fore part of the ship as nearly vertical as possible, at the water line, instead of inclining them outwardly as is done in common practice. This reduces the height of the ship's wake by eliminating the tendency to push the water below the surface.

As a hint that the Yourkevitch design may do what is claimed for it, engineers point to the visible wake of the *Queen Mary* as she rushes along at thirty knots, and then to the wake of the *Normandie* at the same speed. It is clear that the British ship stirs up considerably more water. Whether or not this feature will enable the *Normandie* to outspeed her newer and more powerful rival, the next few months may tell.

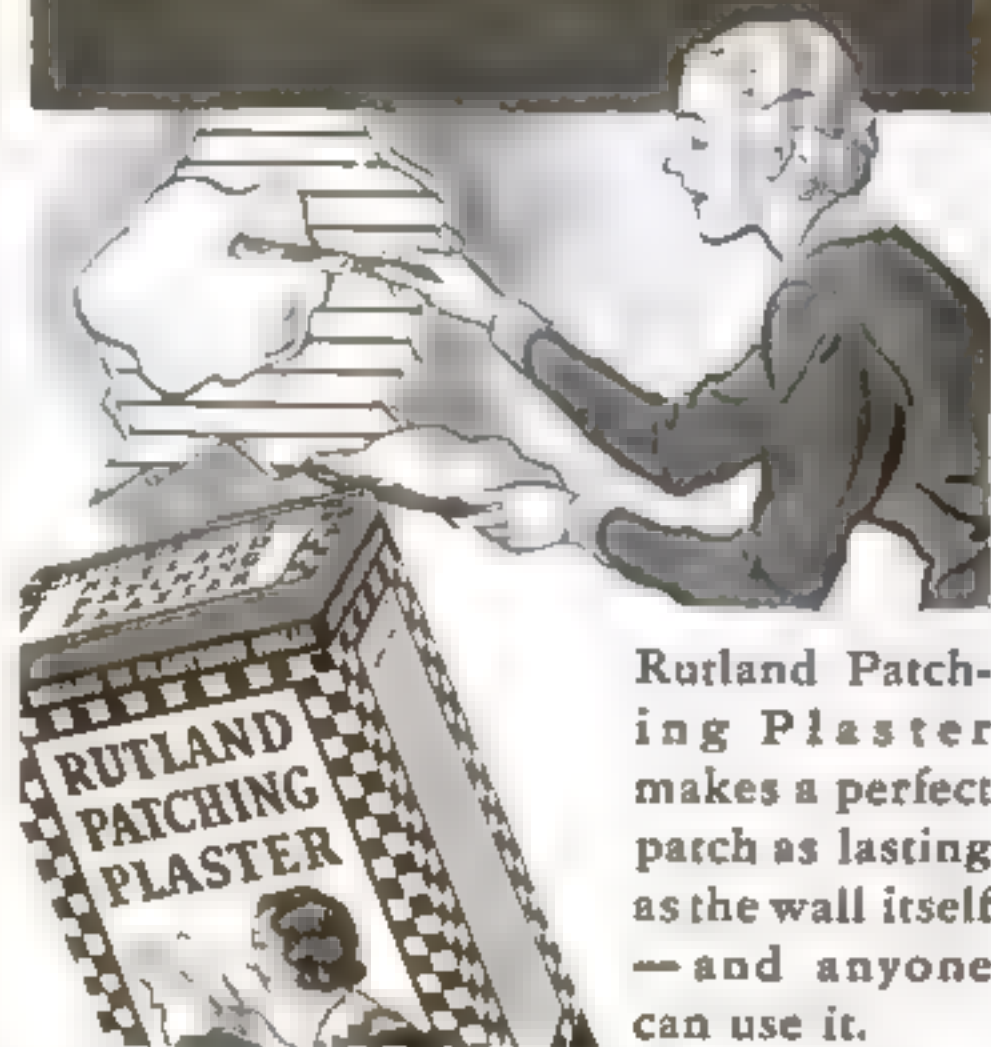
**A** DIFFERENCE between the ships, of more interest than importance, is in the matter of funnels. All three funnels of the *Queen Mary* are legitimate smokestacks, the uptakes from the boiler rooms rising directly through the center of the ship.

The after funnel of the *Normandie*, however, is a dummy. It was added, not only to improve the appearance of the ship, but to bring the center of the wind pressure on the superstructure as nearly as possible at the center of pressure of the submerged part of the ship. The couple, or turning effect, produced by the combined action of wind and sea would thus be minimized, and its influence on the steering of the ship reduced. The funnels owe their great width to the fact that the uptakes are divided, the two parts running up the sides of the ship and coming together only after reaching the upper decks.

One of the greatest problems of most fast ships, that of vibration near the stern, has already been met, (Continued on page 119)

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## BATTLE OF SUPERLINERS

(Continued from page 118)

faced, and cured, in the case of the French ship. The *Queen Mary*, due perhaps to heavier stern construction, largely escaped this affliction from the beginning.

During the first runs of the *Normandie*, it was discovered that the after part of the vessel, especially the upper decks, vibrated annoyingly at speeds above twenty-five or twenty-six knots—in some places as much as two or three millimeters.

Lacking concrete data as to the cause of this vibration, engineers were forced to experiment. To smooth out the flow of water in the wake, they reversed the pitch and the direction of rotation of the outer propellers. This merely caused the ship to maneuver badly. Then they synchronized the propellers, and fitted additional supports throughout the after quarters, with the hope of absorbing the vibratory energy.

ALL this proving of no avail, engineers went back to the Hamburg testing tank. There they devised new shapes for the shaft bearings, ordered new four-bladed propellers to replace the former ones of three blades, and planned considerable strengthening and stiffening at the stern, by adding several hundred tons of deck beams and girders.

After these newly worked out improvements had been made, trials were again run. Opening her throttles, the *Normandie* paced out better than thirty knots. She sped along with the smooth ease of the *Ile de France* at twenty-three! The fight against the vibration bogey had been won!

Without the improvements in engineering practice developed during the past twenty years, the modern 1,000-foot, thirty-knot superliner would still be a Jules Verne dream, mechanically improbable and economically impossible. The chief developments which have helped turn dream into reality are geared turbine and turboelectric drive, high-pressure steam generated in water-tube boilers, and oil fuel. While power has greatly increased, weight of machinery and fuel, in proportion to power, has been drastically reduced.

Compared with the 60,000 horsepower of the *Leviathan* and the *Majestic*, the world's biggest ships until the *Normandie*, the 200,000 horsepower of the *Queen Mary* seems staggering, and at first thought extravagant. We soon learn, however, that weight has not increased nearly in proportion to power, and that the *Queen Mary* can speed across the Atlantic with a fuel load only a few hundred tons in excess of those of the older ships.

THE change from coal to oil fuel, alone, was a great step toward the supership of today. Oil has these advantages: It can be shipped easily into bunkers and fires; coal dust and ashes are eliminated; smaller stokehold and bunker staffs are needed; furnace doors need never be opened; combustion can be scientifically regulated. With the 70,000-horsepower engines of the *Mauretania*, coal-burning power reached its practical limit. When this ship was converted to oil, in 1921, bunker space for 7,000 tons of coal was reduced to space for 5,350 tons of oil; the engine-room staff was reduced from 446 to 175 men; while her turbine power was increased to 80,000 horsepower!

Only nine or ten years ago, it was generally considered impossible to cut the *Mauretania's* time of five days, for the ocean passage, to little more than four days, as has recently been done. Improvement of machinery, enabling it to supply almost double power for given weight, provided the magic. By virtue of further magic, may we soon find some super-superliner racing across the Atlantic to cut still another day from this record?

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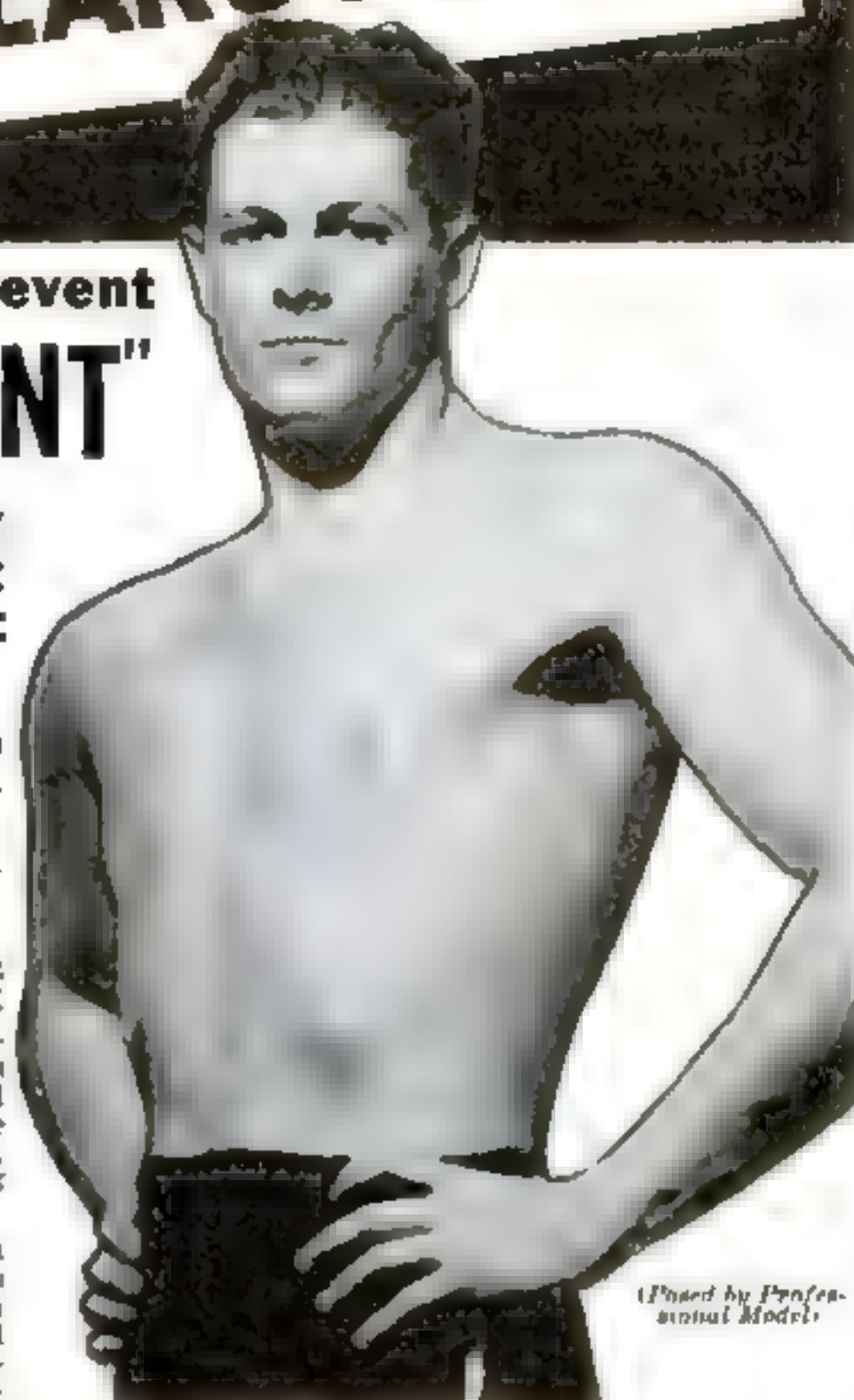
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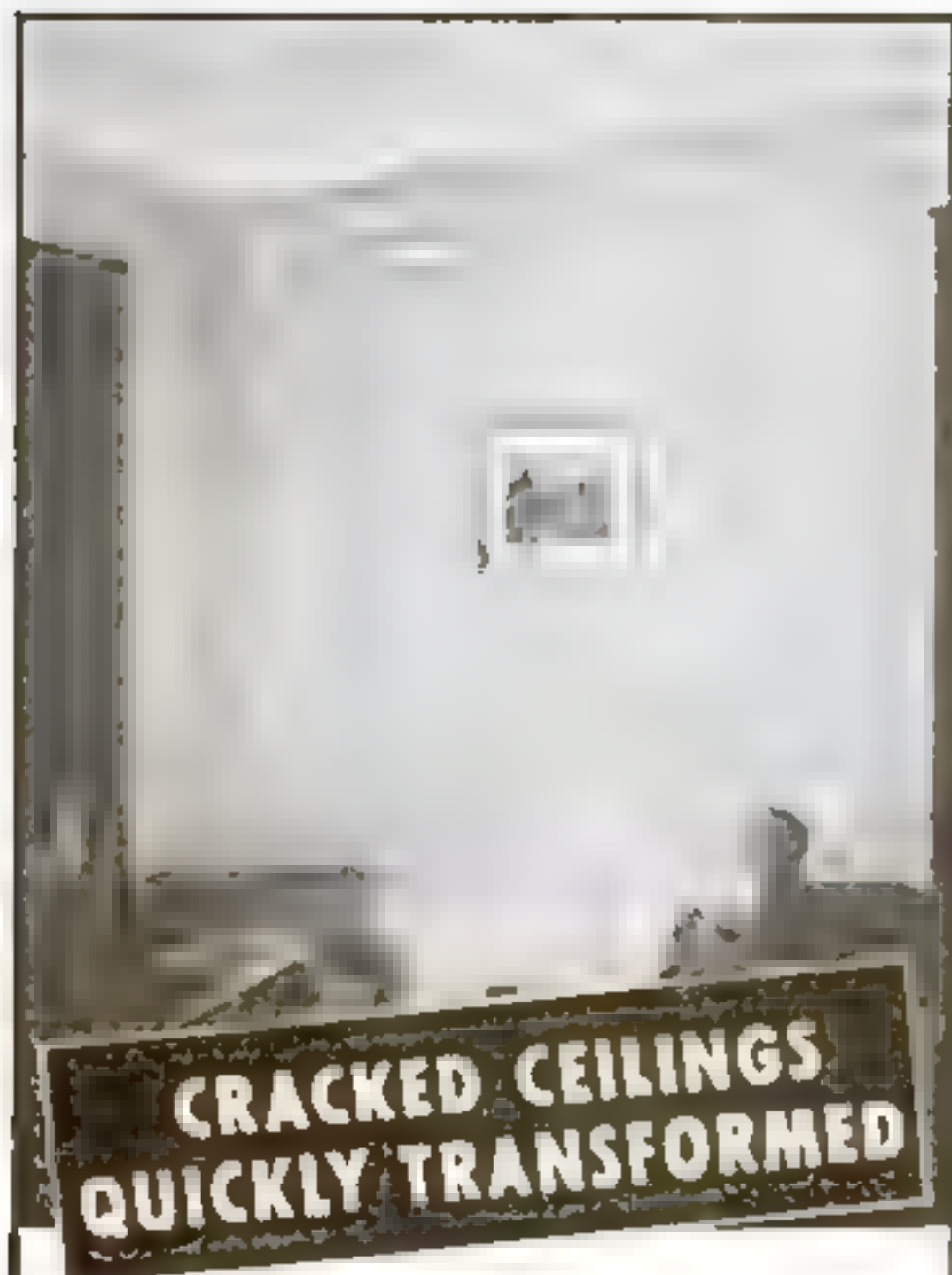
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## STRANGE THINGS THAT ROAM THROUGH THE BODY

(Continued from page 37)

holds a collection of the strange objects he has removed from the bodies of patients. It includes shoe buttons, staples, cartridge primers, pencil caps, pennies, medals, nails, fishhooks, caps from tooth-paste tubes, hairpins, and false teeth.

Some years ago, Dr. Jackson successfully removed a "burr" of five open safety pins, locked together and pointing in different directions, from the throat of a five-year-old child. In the course of his work, he has taken hundreds of open safety pins from the bronchial tubes and lungs of children. Curiously enough, an object that requires more care in removal than even an open safety pin is a peanut. If gripped by pincer-type instruments, it is likely to shatter and the fragments may be sucked deeper into the lungs and produce infection. To remove peanuts, beans, and similar objects from the tubes of the lung, Dr. Jackson has devised an instrument with a swinging spoon on the end. The spoon slides down between the wall of the tube and the object and then swings out at right angles to lift the latter up through the bronchoscope.

**B**EFORE he begins work on a patient, a modern bronchoscopist may spend hours practicing on a dummy fitted with branching rubber tubes that reproduce the "inverted tree" of the human breathing system. Attaching a safety pin to a piece of flannel, and then working through the tubes with his instruments, he unpins and removes it over and over again without tearing the cloth. By such exercises, he perfects his technique for the actual operation. In addition, the patient is X-rayed from several angles to determine the exact location of the foreign body to be removed.

Nowadays, thanks to the X ray and new methods in surgery, foreign objects rarely wander through the system until they reach vital organs and cause serious trouble. As an aid to the quick location of roaming bits of metal, Dr. O. F. Hume, a surgeon, and Dr. A. D. Hummel, professor of physics at Eastern Kentucky State Teachers' College, Richmond, Ky., recently devised a system of "X-ray rulers."

The patient being examined is placed between two sets of crossed measuring sticks which have markings that show up on the X-ray negative. Two pictures are snapped, with the source of the rays moved slightly between exposures. By comparing the negatives and applying a simple geometrical calculation, the men report, they can determine the exact position of the object within the body in a fraction of the time required by previous methods.

**P**ROBABLY the biggest surprise ever provided by an X-ray picture in connection with foreign objects in the body was one reported, not long ago, from Canada. Doctors at a hospital X-rayed the stomach of a woman who had a mania for swallowing bits of metal. The resulting negative showed an accumulation of 2,533 different objects, including buttons, pins, needles, washers, tacks, steel corset stays, pennies, garter fasteners, beads, and pen points. For nearly a year this metallic mass had remained in the woman's stomach, apparently without causing any great inconvenience.

One of the things about which medicine knows little is the difference in constitutions which permits one body to accommodate itself to things that might be fatal to another. A recent report from Texas illustrates what I mean:

A thirty-year-old prisoner in an El Paso jail attracted wide attention by "eating tacks for breakfast and (Continued on page 121)

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## STRANGE THINGS THAT ROAM THROUGH THE BODY

(Continued from page 120)

cartridges for lunch." He said that he had been swallowing metal and glass since he was seven years old, had given vaudeville performances in which he ate bottles and electric light bulbs, and had never experienced any pain in consequence.

Physicians, refusing to credit his story, took X-ray pictures of his stomach and intestines. These showed the presence of tacks and cartridges, evidently passing through the digestive tract without causing trouble. What probably would have resulted in death for the average person was, because of some peculiar condition of his body, producing no ill effect.

**I**N OTHER cases, shoemakers' awls, can openers, and spools of thread have been swallowed, and have worked their way out through the lining of the stomach, have been removed by operations, or have been passed off naturally by the body. I remember one curious instance in which a child gulped down a small spool of silk thread with a needle stuck through it. Its body passed off the spool but the needle remained in the stomach, where it was found by means of the X ray and removed.

Not all objects that wander through the body, however, are visible to the X ray. Many things besides metal find their way into the system and some of them migrate through the tunnels and caverns of the body for months and years. Strangest of this oddity group are the ones that go down the wind-pipe and begin their travels in the lungs.

Recently, I heard of a case of that kind that occurred under curious circumstances.

Half a dozen boys were slipping the heads of grass stalks into the sleeves of their sweaters and watching them "crawl" up the garment as the movements of the body propelled the stiff bristles along. Tiring of this pastime, they invented a more daring one. While one boy stood with his mouth open, the rest aimed grass-head spears at the target. Finally, when a child about four years old was providing the target, one of the boys scored a bullseye. The child choked, swallowed, and the grass head "went down the wrong way" and entered his lungs.

Shortly afterwards, he developed a racking cough. A high fever set in, and he became seriously ill. On the side of his chest, a nurse noticed a mysterious red swelling which grew in size. Three weeks after the accident, the swelling broke. Out came a grass head, fully an inch and three-quarters long. It had traveled down the bronchial tube, through the lung, and out through the chest wall. As soon as the child's body was free of this intruder, he began to regain his health and strength.

**I**N ANOTHER case in the middle west, a farmer inhaled a beard of rye while threshing grain. The tough little spear worked its way through the lung, and fifteen days later appeared at the surface of his chest, coming out between two of the ribs.

Thus, of innumerable shapes and sizes and materials are the objects that travel through the human body. To the layman, the records of these strange meanderings read like so many Arabian Nights stories of medicine. To the physician, however, they offer an important and still mysterious field for research.

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## BOY SCIENTISTS MAKE AMAZING DISCOVERIES

(Continued from page 31)

Thus, Billy Betteridge, a fifteen-year-old boy in Los Angeles, Calif., produced a sleek, streamlined racing car that can streak around a banked oval at 100-mile-an-hour speeds. It was built almost entirely from discarded parts picked up at race tracks, garages, and airports. Powered by an outboard motor, the little bullet on wheels has vibrationless mountings, a chain drive, and a hood that was once the cowling of an airplane.

At American airports, in many parts of the country, school-age fledglings have demonstrated a mastery of the air. Jack Chapman, of East Moriches, N.Y., for example, was only eleven years old when he soared aloft on his first solo. He had to be propped ahead with two cushions in order to reach the rudder pedals of the machine. Even younger is the son of a North Carolina airman, who last year, when he was only six, took off and landed a small monoplane.

ONE of the most remarkable amateur scientific laboratories in the country is undoubtedly that run by three schoolboys at Hollidaysburg, Pa. These young experimenters, Dean Walter and Ralph and Roland Diehl, specialize in electrical and mechanical work, printing, photographic developing, and chemistry research. They etch their own engravings, make their own printing electrotypes, and pull proofs on their own press. They manufacture lubricants, fire-extinguishing compounds, microphones, photo-electric cells, rat poison, soap, and mirrors. Tooth powder is a recent addition to their line, and they also are working on synthetic rubber.

Not long ago, they showed what science could do in setting a trap for a persistent locker thief at their school. Obtaining an old fountain-pen bladder, they filled it with a silver nitrate solution and concealed it at the back of the locker handle. When the thief grabbed the handle, the bladder spurted the chemical solution over his hand, leaving a telltale stain that exposed his guilt.

Probably the outstanding exhibition of the activity of junior scientists in the United States is the annual Science Congress, sponsored by the American Institute, in New York City. Run on the same formal plan as the meetings of the American Association for the Advancement of Science, the congresses attract a thousand or more youngsters who listen attentively to lectures and demonstrations by juvenile scientists, many of whom will not reach voting age for half a decade. During one session, they presented papers on such varied topics as experiments with synthetic resins, the regeneration of worms, and variations in the number of red corpuscles in the human blood stream.

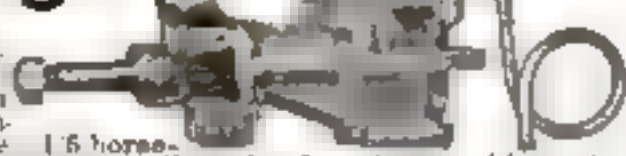
AT THE last congress, a representative of one of the country's leading research laboratories drifted from meeting to meeting like a baseball scout hunting for another Dizzy Dean. From such groups of scientists-in-the-bud may come the Thomas A. Edisons, the Charles Goodyears, the Luther Burbanks of the future.

For, throughout the story of science, celebrated achievements have often sprung from some interest developed in youth. A toy helicopter turned the minds of two Ohio boys, the Wright brothers, to the study of aviation. Hiram Bentley, the outstanding American authority on snow crystals, started his life work at fourteen when he received a small microscope for a birthday present. Similarly, the work of other men, famous in research and invention, can be traced to early hobbies. So, the activity of the far-flung junior army of science is of more than passing interest. It is a healthy indication of coming progress.

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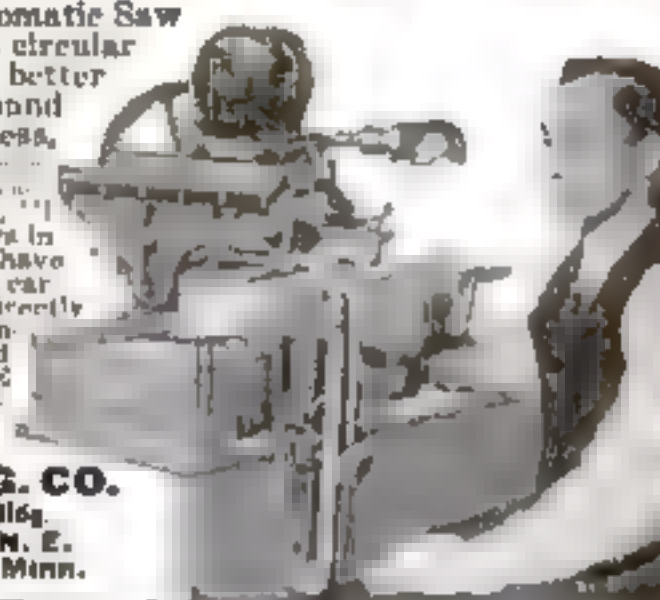
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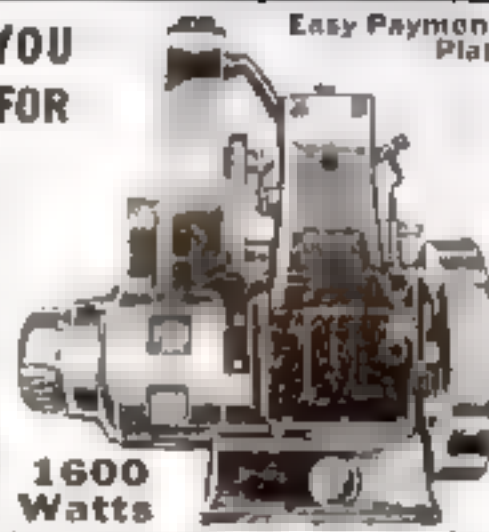


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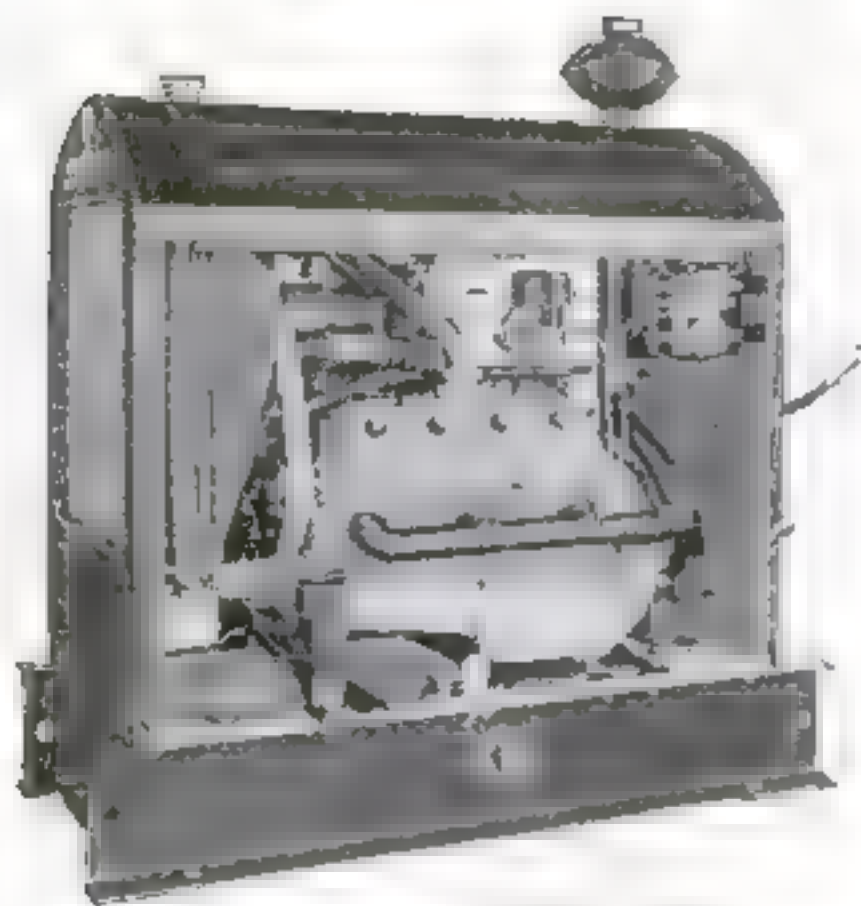
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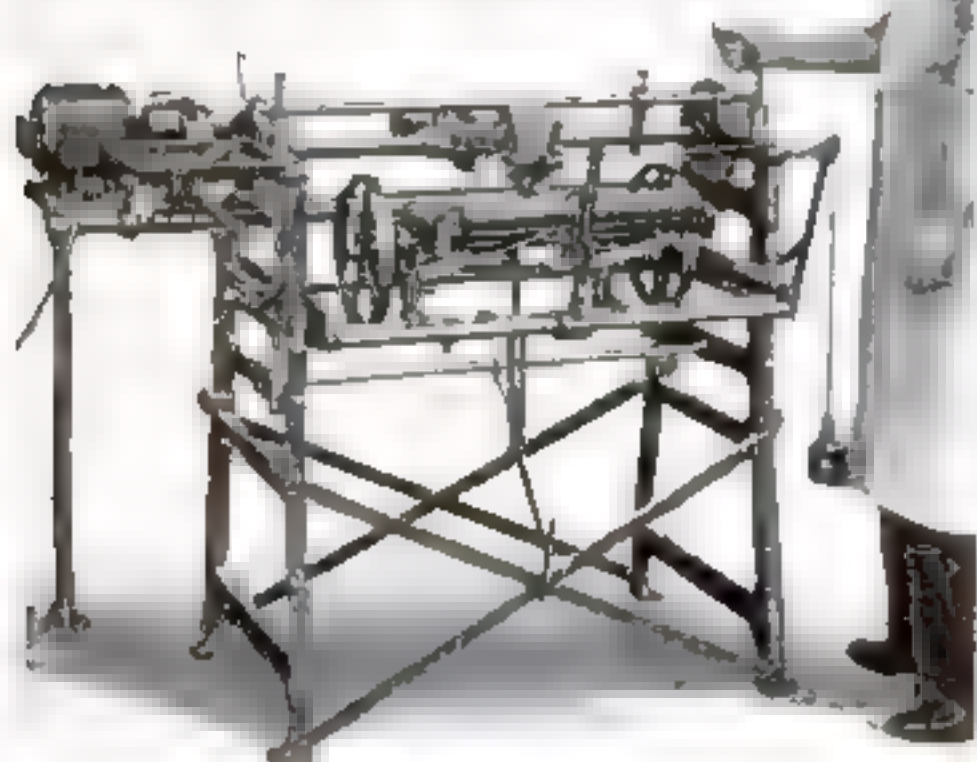
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and Complete Plans  
THE FATE-ROOT-WEATH CO.  
537 Oak St., Plymouth, Ohio



## TWO-MAN GOLD MINE

(Continued from page 39)

they got an eighty-horsepower gasoline engine and a three-cylinder, plunger-type mining pump capable of pumping 10,000 gallons of water an hour to a height of 2,500 feet. By December, motor, pump, and pipes were all in position and a torrent of water was turning out from \$150 to \$200 worth of gold a day.

Hardly had they got under way, however, before they were haled into court by a water company which declared they were polluting the river by their operations. The court issued an injunction restraining the miners from further use of the stream. That apparently stopped them in their tracks. But, after a few weeks, Hemming thought out a detour around the injunction. He dug a well in the canyon some distance from the river and rearranged his machinery to pump from the well and divert the water from the tail dump of the mine back into it. Thus the mine continued operations without polluting the stream. Under law, the well provided water which could not be claimed under the priority rights of the water company.

FOR months afterwards, the machinery poured a steady stream of gold into the sluice boxes, and worries at the two-man gold mine seemed over. Then disaster faced the operators once more. The state ran a highway along the canyon, condemning a right-of-way across a portion of the mining claim. The road ran between the mine and the well which supplied the water. According to law, only a public utility company can be granted a franchise to carry a pipe line under or over such a mountain road.

That seemed the end for the two prospectors. But again Hemming sidestepped the difficulty. He dug into law books and found that a bridge is not recognized legally as a physical part of a highway. Just below the camp, the highway crossed the river. The miners obtained permission from the court to run their pipe line across the highway under this bridge and operations commenced once more.

Since then, no further legal entanglements have arisen. With the hydraulic nozzles roaring, rocks, sand, and gold-bearing gravel go thumping down through the sluices, leaving behind, at the end of an eight-hour day, from \$200 to \$400 worth of pure gold. Some of it is coarse, some fine, some in chunks worth from four dollars to \$100 apiece.

AS THE two-man mine is operating with hardly any capital investment, without any dividends to stockholders, and with no wages to workers, the income is almost clear profit for the two owners. They have enough gold-bearing material blocked out to keep the mine in operation for at least another five years at its present rate of production. The water driven through second-hand pipes by a second-hand motor accomplishes the work of 100 men with picks and shovels. The profitable little mine, in truth a "Depression Buster" for its two owners, is a monument to ingenuity and perseverance.

## SILVER POLISHERS NOW CANVASS BRITISH HOMES

PROFESSIONAL silver polishers, traveling from house to house and restoring the luster to tarnished silverware for a small fee, are being employed by the silver trade in England. Because modern stainless metals call for little polishing, while silver tarnishes readily, the former have risen in favor with busy housewives, and sales of silverware have, accordingly, decreased. The new plan is an effort to bring to the silver industry the same principle under which makers of high-grade pianos furnish tuners to their customers.

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to the brand of  
grand aroma



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## GUS GIVES SOME TIPS ON ECONOMICAL DRIVING

(Continued from page 74)

any doubt about the water supply, use distilled water."

"That makes sense. I'll remember it," Selden commented, as he removed the filler cap on his radiator and inspected the water level. "How is this, now?"

"Just a little low, on account of the boiling," Gus decided, as he reached for the water can. "The water here is O. K."

"Now, there's another place where too much water does a lot of harm, and that's in your battery," Gus went on. "The natural thing for a careful driver to do, when he is figuring on taking a long trip, is to screw the caps off the battery cells and fill each cell to the brim with water. Nine times out of ten, if the car has been used only for shopping trips around town for a while, the battery charge is low, quite a bit of the acid has gone into the plates in the form of chemical compounds, and the level of the solution is a bit lower than it otherwise would be."

"THEN filling is just what it needs, isn't it?" Selden interrupted.

"Yes and no," laughed Gus. "The driver ought to make sure that the plates are covered, but he should be mighty careful not to add too much. If he fills each cell to the top, under such conditions, what happens? Off he goes on his trip, and the current flows through the battery steadily for hour after hour. The solution expands as the acid is driven out of the plates, and because some heat is developed. Then, when it gets near full charge, lots of gas bubbles form to still further increase the bulk of the solution. There's only one place for the solution to go, and that is out through the gas holes in the caps. That's bad, for two reasons. First, the cells lose acid that they need; second, the slopping acid starts corrosion of the battery box and the terminal wires."

"I thought battery cell caps were designed to keep the solution from coming out," Selden objected.

"No cap can keep the solution in when the battery is filled too full under such conditions," Gus explained. "Point is, you ought to test the battery with a hydrometer before you put any water in. If the gravity is pretty low, only put in enough to cover the plates by about an eighth of an inch. Then, at the end of the first day's run, after the battery has had a chance to get charged, take another look."

"Then, too," Gus continued, "you'll see lots of careful tourists in summer burning their headlights in the daytime to keep the battery from continual overcharging. Now, while burning the lights is better than tearing the battery plates to pieces with too much charging, it isn't a very bright trick. What's the use of generating all that current and then wasting it to wear out the headlight bulbs? It's much better to spend a couple of minutes with a screw driver and cut the generator charging rate by moving the third brush down to the point where it only charges a maximum of four to six amperes. Then, when you get home and the car is going to be used only for the usual short trips and shopping calls, you can move the brush back to give you a higher charging rate."

"HOW do you know what the right charging rate is?" Selden asked.

"You've got your generator set right for your own driving conditions," Gus pointed out, "when the hydrometer shows the battery fully charged at the end of every short trip and yet you don't have to add water more often than once every two weeks if you're using it a lot, or every month or two if the car isn't run very much." (Continued on page 125)

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# Electroplating

FOR HOBBY OR PROFIT

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Written especially for the amateur, this book tells you how to utilize many odds and ends to build a complete home electroplating workshop. Instructions, pictures, and diagrams show how easy you can do copper, nickel, chromium, silver and gold plating. How you can plate household or automobile fixtures, hardware, tools, silverware, ornaments, clocks, watches, bracelets, rings, metal parts of all kinds.

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Takes you in easy-to-grasp stages right from the simple first principles of electroplating to expert professional type work. It's interesting and profitable also to plate non-metallic articles made from wood—fabric—leather—plastics—glass or porcelain. You can get results plating less commonly used metals such as zinc, cadmium, cobalt, antimony, lead, rhodium, and alloys. How to do lacquering, inlaying, overlaying, etching. How to plate unusual designs with contrasting metals for striking effects—obtain unusual finishes with chemical coloring. Scores of illustrations, diagrams, and pictures make it easy to do electroplating in all its branches.

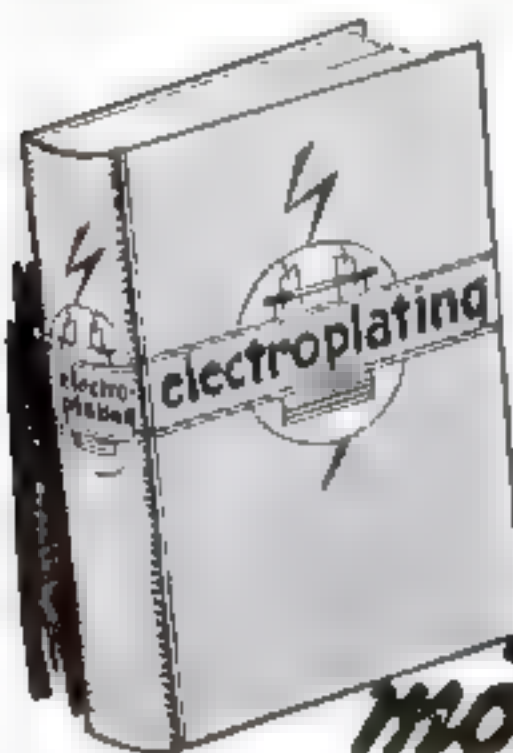


You can get results plating less commonly used metals such as zinc, cadmium, cobalt, antimony, lead, rhodium, and alloys. How to do lacquering, inlaying, overlaying, etching. How to plate unusual designs with contrasting metals for striking effects—obtain unusual finishes with chemical coloring. Scores of illustrations, diagrams, and pictures make it easy to do electroplating in all its branches.

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## GUS GIVES SOME TIPS ON ECONOMICAL DRIVING

(Continued from page 124)

"Any other good ideas that will save me money on the operation of my car?" Selden inquired.

"Here's one that applies to this car and to other late models," said Gus, as he lifted the hood and pointed to a cylindrical bump on the side of the carburetor. "This little gadget or its equivalent is on every modern carburetor. Inside this cylinder is a piston that is connected to the throttle. When you open the throttle quickly raw gasoline is shot into the mixing chamber. That eliminates starving and the popping-back you used to get on old-fashioned cars when you opened the throttle too quickly.

"ASIDE from that," Gus went on, the device has some definite advantages—and some disadvantages, too, according to how you handle the car. It's a definite disadvantage if you're one of those chaps who keep stepping on the accelerator every few seconds when they're maneuvering a car to get it into a parking space, or driving in traffic. Watch some one who has the habit and you'll see bursts of black smoke shooting out of his exhaust pipe, showing how much too rich that excess squirting of gasoline makes his mixture. I've seen a man flood his motor so badly, handling it that way, that it stalled and had to be cranked with the starter several seconds with the throttle shut to clear away the excess gas.

"The same thing happens, to some extent, if you ride the throttle in your regular driving. If you keep stepping on the throttle and taking your foot up again, instead of maintaining a steady pressure that will keep the car at the speed you want, you're going to use more gas to the mile.

"On the other hand," Gus continued, "that gasoline-squirting device is a real help in getting the motor started. In fact, if you use high-grade gas, you can stop using the choke entirely during the summer, and even in winter except when the motor is stone cold. All you have to do is to give two quick, short jabs on the throttle pedal, then hold it open a trifle and step on the starter. The gasoline you squirt that way gives the same result we used to get in the old days when we 'primed' a motor by squirting gasoline from an oil can into the manifold or cylinder heads through petcocks.

"Not having to use the choke saves gas, I suppose," Selden suggested.

"Especially when you forget to push the choke in, as everybody does now and then," Gus replied, "And, of course, it saves time and trouble not to have to think about the choke."

"WHY doesn't that idea work just as well with low-grade gas in the tank?" Selden asked.

"The trouble is that low-grade gas doesn't vaporize very well in a cold motor," Gus replied. "If you pump the gas into the manifold in the way I suggested, the motor will kick over a few times and then die, unless you pull out the choke right away and keep it out until the motor warms up a bit so that the regular flow of gas will be vaporized enough."

"I'm going to try it," Selden smiled. "Have you any other good ideas you can give a poor salesman?"

"Sure," Gus grinned significantly, as he bent over and inspected a slight kink in the front bumper.

"Well, if you're going to tell me how to save wear on the bumper, spare my feelings, Gus," Selden chuckled, as he climbed behind the wheel. "The next time my front bumper gets bent, it'll be because somebody backs into me when I'm standing still!"

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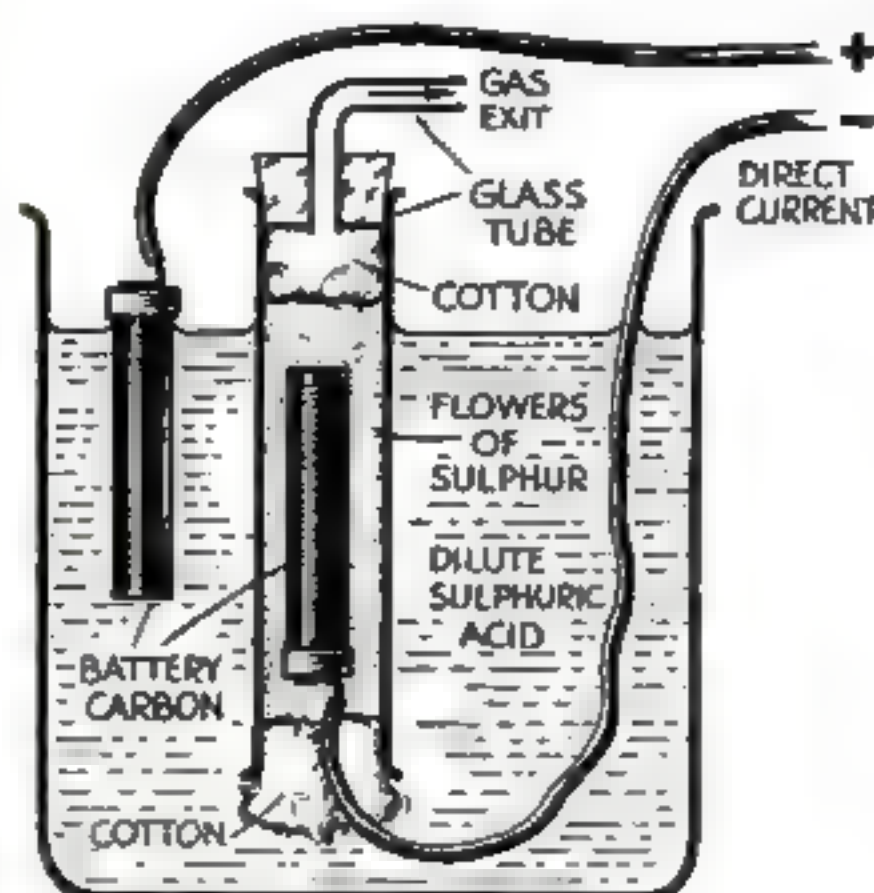
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INVESTIGATE OUR OTHER "FAMOUS FIFTY" GRAPHITE PRODUCTS

## CHEMICAL MATCHMAKERS

(Continued from page 69)



Set-up of a simple "electrolytic cell" for generating hydrogen gas in the presence of sulphur to observe its ability to react and form hydrogen sulphide while in the active, nascent state.

that there is only the tiniest fraction of a second in which it can be done.

A handy hydrogen-gas generator for this and other experiments is easy to make from an Erlenmeyer flask of about 250-cubic-centimeter capacity, containing scraps of zinc or iron tacks or nails and fitted with a separatory funnel for admitting dilute sulphuric acid. An inverted "U" of glass tubing delivers the gas that is generated to a test tube containing the liquid to be experimented with. The set-up may be mounted conveniently upon a wooden base, as shown in an accompanying illustration. Three or four common screw hooks, bent straight and covered with short lengths of small rubber tubing, make fingers to hold the flask in place. The test tube is supported by a metal clamp, screwed to a little wooden post about one inch square. Thus, the whole apparatus is self-contained, is easily taken apart for cleaning, and—what is still more important—will not topple and break. When you fill the funnel with dilute acid and admit the liquid slowly to the flask, a copious stream of hydrogen gas is generated.

IF YOU place a solution of ferric chloride in the test tube and let hydrogen gas bubble through it, no chemical reaction will occur. Nevertheless, hydrogen gas can be made to react with ferric chloride. This will happen if the hydrogen comes in contact with the chemical before the atoms of gas have had time to pair up—in other words, while the hydrogen is still "new-born." How can you catch the atoms in this instant? All you have to do is to add a few drops of the ferric chloride solution directly to the generating flask.

Now, when acid is added to the zinc as before, the ferric chloride is acted upon, because the hydrogen comes in contact with it at the precise moment that the gas is liberated. The new-born hydrogen reduces or transforms the ferric chloride to ferrous chloride.

To prove this, add several drops of potassium ferricyanide solution to each of the vessels containing ferric chloride that hydrogen gas has bubbled through—the test tube and the generating flask. In the latter alone, a blue precipitate forms. Known as Turnbull's blue, it provides a distinctive color test that readily distinguishes between ferric and ferrous compounds.

Passing an electric current through a dilute acid gives you another way of obtaining nascent or new-born hydrogen for your experiments. It (Continued on page 127)

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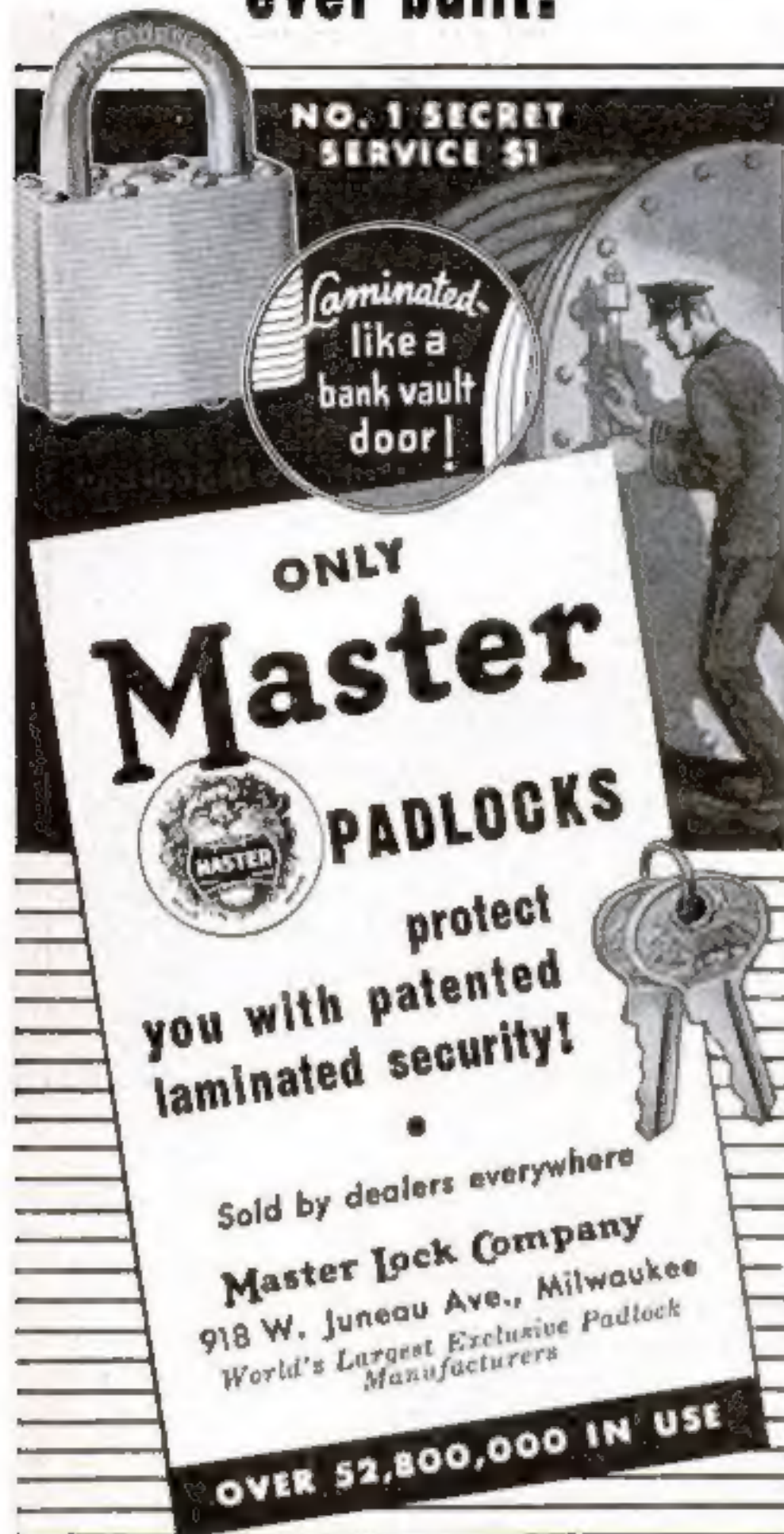
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## CHEMICAL MATCHMAKERS

(Continued from page 126)

will enable you to show that in this active state, hydrogen reacts with sulphur and forms hydrogen sulphide gas. The product of the reaction can be detected by its odor or with lead acetate paper.

A simple "electrolytic cell" for this purpose can be made from a beaker, or glass tumbler, and a pair of carbons from old flashlight cells. Insert one of the carbon rods (with a wire attached) in a length of glass tubing about three quarters of an inch in diameter, such as a test tube with the bottom cut off. Wad one end of the tubing with absorbent cotton, insert the carbon rod, and pack the tubing with flowers of sulphur that you have previously ground or rubbed in a mortar with dilute sulphuric acid. When the tube is nearly filled, close the remaining opening with a second plug of absorbent cotton and a cork carrying a glass "L" tube, as one of the diagrams shows. Fill the beaker or tumbler with dilute sulphuric acid. Pouring strong sulphuric acid, slowly, into four times its volume of water gives a solution of the right strength for use in the mortar and the beaker, as well as in the hydrogen generator previously described.

To pass an electric current through the cell, connect the sulphur-packed carbon rod with the negative terminal of a storage battery, or of a battery of three dry cells connected in series. Connect the remaining carbon rod with the positive source of electric current, and lower this carbon into the beaker. Current now flows through the cell. At the enclosed carbon rod which serves as the negative electrode, hydrogen is liberated from the acid. It is in the "nascent" state and combines with the sulphur about it to form hydrogen sulphide. As the gas escapes from the exit tube, you can test it by holding a strip of paper, moistened with lead acetate solution, at the mouth of the tubing. A black spot of lead sulphide, forming upon the paper, identifies the hydrogen sulphide gas.

## EXPERT ARMY WAGES WAR ON DUTCH ELM DISEASE

(Continued from page 55)

speeds up the work of destroying infected trees. The effectiveness of the entire campaign depends to a large extent upon the promptness with which trees can be destroyed after they are found.

Is your elm safe? Does it show signs of sickness? You can help Uncle Sam tremendously by answering these questions.

In the first place, every dead or dying elm offers a good landing place for the bark beetles. Such trees, which never can be more than an eyesore if left standing, should be cut down and burned at once. Care to keep valuable elms healthy, and therefore less attractive to the dangerous insects, is especially important at this time.

An elm with yellowing, wilted leaves is open to instant suspicion. If there is such a tree on or near your property, cut six or eight twigs, about the size of a pencil and six inches long, from the branches and mail them to the Dutch Elm Disease Laboratory, Morristown, N.J.

Present indications are that the only possible hope for the continued existence of the elm in this country is the prompt destruction of every diseased tree. This calls for careful and continuous scouting of thousands of square miles for a number of years. The war against Dutch elm disease has just begun, and victory to be effective must be complete, for a single one of the enemy, if permitted to remain in existence, might cause the plague to flare up in later years to create new and greater destruction.



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## "And my beard's plenty tough!"

\$15



Men who are exposed to all kinds of weather, who have tough skins and wiry beards, shave quickly and easily with the Schick. Yet a boy, just starting to clean the down from his tender cheeks, finds the Schick as gentle in action as if he rubbed his face with his finger tips.

A totally blind man could shave in perfect safety and comfort with not the slightest danger of cutting or hurting himself.

### Pioneer in painless shaving

Not since savages scraped off the hair with shells or quartz has there been a radically different method of shaving until Schick invented the electric shaver.

It does away with all discomfort—with blades, water, soap, cream, lather, brush or the necessity for lotions or powder. It gives you a new skin to replace the hardened tissue Nature has built up if you have used lather and blades.

### Why Schick above all

For a working lifetime Schick studied hair, faces and mechanical ways to shave. He experimented with cutters of many constructions and shapes. He found that a flat

cutter with an extremely thin slotted plate, nestled closely into the skin, depressed the tiny mounds and enabled the inner cutter to shave off the hairs more efficiently and closer than any other shape of cutter shaved them.

All our past and present research convinces us that this patented construction is still the most efficient of all.

### Shaving at its lowest cost

The life of a Schick Shaver is not known. Shavers we made five years ago are still performing satisfactorily. (We have made many mechanical improvements since then.)

There are no blades to buy, no parts to sharpen—and none to renew for an indefinite time. You need no soap, cream, brush nor lotions. The cost of electricity for a year's shaving is so small that a dime would cover it easily.

How, then, could you shave at a lower cost per shave?

### See a dealer

Ask any Schick dealer to show you the shaver and demonstrate how simply and quickly you could learn the new way of shaving which is revolutionizing the shaving habits of the world. Be sure, too, that he is an authorized dealer through whom we guarantee and service Schick Shavers.

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# SCHICK SHAVER

## SIMPLE OSCILLOSCOPE MAKES SOUND VISIBLE

(Continued from page 73)

trol" ( $R_{12}$ ) to the full-on position. As this is done, a line should appear across the screen. If it is not in a relatively horizontal position, the socket of the cathode-ray tube should be turned in its mounting. Always adjust the intensity and focus controls so as to obtain a sharp, clear pattern, but not one that is too bright.

Some idea of just how the cathode-ray oscilloscope operates can be obtained by connecting a sensitive microphone into the circuit. To do this, wire an ordinary single-button microphone in series with about six volts of dry cells and the primary of a regulation microphone transformer. The secondary winding should be connected to the two terminals marked "V plate" on the oscilloscope.

AS YOU talk into the microphone, manipulate the two controls as already outlined. All sorts of odd patterns will appear on the screen as you pronounce words. By means of the electron beam inside the cathode-ray tube, the oscilloscope is producing an accurate moving picture of your voice.

The same test can be applied to the sixty-cycle alternating current that provides the light and power in your home. Simply wire a class "B" amplifier input transformer and a half-megohm potentiometer into the house lighting circuit, as shown, and connect the hook-up to the two "V-plate" terminals.

With the switch  $Sw_3$  turned to position four ( $C_4$ ), adjustment of the fine frequency control ( $R_8$ ) will enable you to get an image of a single S-shaped cycle of the sixty-cycle current. Further manipulation of  $R_8$  will allow two complete cycles to be viewed.

It is this ability of the oscilloscope to give moving images of the wave forms of various types of vibrations and oscillations that makes it particularly valuable in radio and electrical testing. With it, the engineer can obtain an accurate check on frequencies and the operation of circuits. In transmitter work, the patterns can be used to check the quality of the modulation.

Following is the list of parts required for building the oscilloscope:

- $R_1$ .—Fixed resistor, 2,000 ohm, 1 watt.
- $R_2$ .—Fixed resistor, 1 meg., 1 watt.
- $R_3$ .—Potentiometer,  $\frac{1}{2}$  meg.
- $R_4$ .—Potentiometer, .2 meg.
- $R_5$  and  $R_6$ .—Fixed resistors, 75,000 ohm, 2 watt.
- $R_7$ .—Fixed resistor, 50,000 ohm, 2 watt.
- $R_8$ .—Fixed resistor, .3 meg.,  $\frac{1}{2}$  watt.
- $R_9$ .—Potentiometer, 50,000 ohm.
- $R_{10}$ .—Fixed resistor, 2,000 ohm,  $\frac{1}{2}$  watt.
- $R_{11}$ .—Fixed resistor, 1,000 ohm,  $\frac{1}{2}$  watt.
- $R_{12}$ .—Potentiometer, 1 meg.
- $R_{13}$ .—Fixed resistor, 1 meg.,  $\frac{1}{2}$  watt.
- $R_{14}$ .—Fixed resistor, 10 meg.,  $\frac{1}{2}$  watt.
- $C_1$  and  $C_2$ .—Electrolytic condensers, dual 4 mfd.
- $C_3$ .—Fixed condenser, .01 mfd., 400 v.
- $C_4$ .—Fixed condenser, .1 mfd., 400 v.
- $C_5$ .—Fixed condenser, .02 mfd., 400 v.
- $C_6$ .—Fixed condenser, .005 mfd., 400 v.
- $C_7$ .—Fixed condenser, .001 mfd., 400 v.
- $C_8$ .—Fixed condenser, mica, .0001 mfd., 400 v.
- $C_9$ .—Fixed condenser, tubular, paper, .5 mfd., 400 v.

Miscellaneous.—Steel cabinet, aluminum chassis, three octal sockets, one five-prong socket, switches, knobs, tubes (913, 6X5, 6K7, and 885), power transformer, terminal posts, seven-position dial plate, nuts, bolts, solder, wire, etc.

If you have to buy all new parts, the oscilloscope will cost about twelve dollars, plus nine dollars for the tubes. However, careful shopping, and the use of whatever spare radio parts happen to be on hand, will reduce the cost of the unit considerably.



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